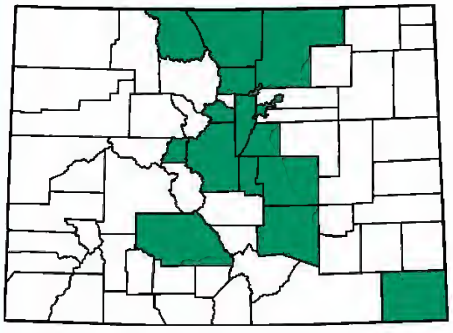
Aquilegia

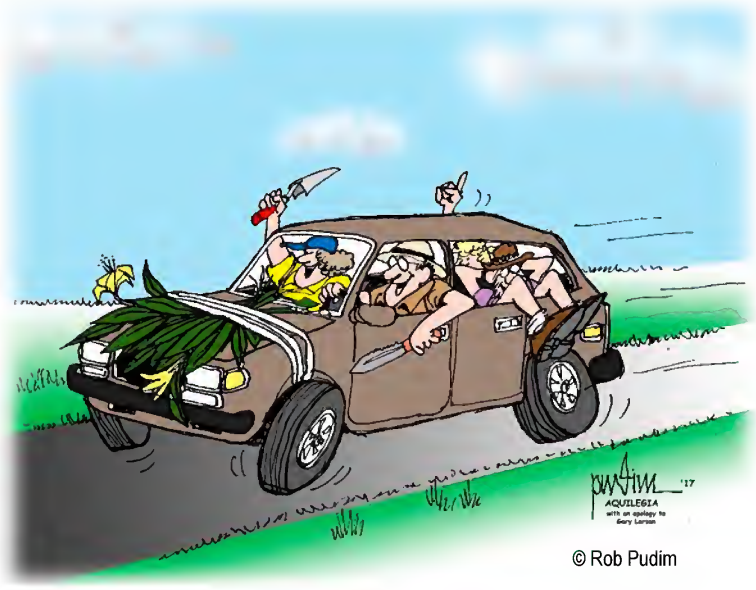
Newsletter of the Colorado Native Plant Society
Volume 43 No. 1 Winter 2019

Miner's candle, *Oreocarya virgata* (Boraginaceae). This biennial cryptantha is common in the foothills and mountains of the Front Range, where it usually blooms in late spring or early summer. The one- to two-foot tall single thick stem is enclosed by a dense mass of smaller leaves and calyx tubes, as well as larger projecting leaves. The projecting leaves gradually decrease in size up the stalk. Like many plants in the borage family, all structures except the petals are covered in dense, stiff hairs. Miner's candle is usually found in dry sandy or gravelly soils. *Oreocarya*, as well as several other genera, has recently been resurrected as a separate genus from the *Cryptantha* clade. Nutlet morphology is an important taxonomic criterion. *KA*



Map adapted from Ackerfield, J. *Flora of Colorado*, p. 218 (2015).

Botanicum absurdum by Rob Pudim



© Rob Pudim

PHOTO CREDITS: FRONT COVER AND INSIDE BACK COVER: © Jan Gorski. Jan recently joined CoNPS and is grateful for all of the amazing expertise shared by fellow members, especially on field trips and during Native Plant Master® courses. She is an avid photographer, hiker, birder, avocational archaeologist, and all-around outdoor lover. She recently planted over 50 native plants in her yard and has accepted a challenge to replace much of the turf with native plants.

Aquilegia: Newsletter of the Colorado Native Plant Society

Dedicated to furthering the knowledge, appreciation, and conservation of native plants and habitats of Colorado through education, stewardship, and advocacy

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Featured Story

Lost Flower is Found Again: *Campanula aparinoides*

By Elizabeth Taylor

On the morning of August 3, 2018, three amateur plant enthusiasts—Barb Harbach, Cathy Fischer, and I—were inventorying plant species along the bank of Gove Ditch in Sandstone Ranch, Douglas County's newest open space. We were participating in the Sandstone Ranch Natural Resource Inventory project. The day was beautiful, and our survey efforts were going well. Among the numerous water-loving species we observed, we were pleased to find several that were not yet on our Sandstone Ranch plant inventory list, including marsh skullcap (*Scutellaria galericulata*), mountain sneezeweed (*Helenium autumnale*), water crowfoot (*Ranunculus aquatilis*), coon's tail (*Ceratophyllum demersum*), common duckweed (*Lemna minor*), and tall manna grass (*Glyceria elata*). Although none of these plants are uncommon in Colorado, I list them here to provide you with an idea of the marshy, stream-side habitat.

One of the first photos of the rediscovered *Campanula aparinoides* against lined notepaper. The lines are 7.5 mm apart. The corolla is less than 8 mm long. © 2018 Curt Frankenfeld

As I leaned over to look more closely at a marsh skullcap close to the water's edge, a low growing plant stuck to my pant leg from behind. At first, I thought that it might be a bedstraw such as stickwilly or cleavers (*Galium aparine*), one of four species of bedstraws we had found so far on the ranch. However, as I reached down to brush the plant off my clothing, I was startled to discover that it was an unfamiliar plant clinging to me and demanding my attention. Several similar plants were sprawling in tangled masses and climbing on nearby vegetation. Upon further examination, I saw that the small plants with the narrow, alternate, sticky leaves and tiny, white, bell-shaped flowers resembled a miniature *Campanula*, but not one whose acquaintance I had made previously. Barb Harbach and I keyed out the plant using both Jennifer Ackerfield's *Flora of Colorado* (2015) and *Colorado Flora: Eastern Slope*, Fourth Edition (2012) by William A. Weber and Ronald C. Wittmann.

We were fairly certain that our new-found friend was *Campanula aparinoides*, the marsh or bedstraw bellflower. However, the keys we were using caused us to have an element of doubt. Weber writes on page 150 that the plant is extremely rare in Colorado and that it was "collected by Parry in northern South Park in 1861, and once in the Denver area by Eastwood." Ackerfield notes on page 261 that the plant is "rare in moist meadows and along streams, known from 2 very old collections in Colorado along the South Platte." She says that it is "possibly extirpated from Colorado." She goes on to provide the following details:

"The first collection of this species in Colorado was made by Hall and Harbour in 1862, labeled as collected in South Park but probably collected along the Platte as South Park would be out of range and habitat for this species. The other collection was made by Alice Eastwood sometime prior to 1893 for her *Popular Flora of Denver*. Eastwood notes that this was found several years ago near Smith's Bridge along the Platte in Denver but hasn't been seen since. These collections may represent depauperate forms of *C. rotundifolia*, which rarely can have pale blue or white flowers. If these collections are of *C. aparinoides*, then this species is apparently extirpated from Colorado."

Three days later, Barb and I returned to the area accompanied by Curt Frankenfeld, another volunteer naturalist, who photographed the plant for us. We carefully keyed it out again and also checked other references from locations outside of Colorado. At last we were certain that our initial identification was correct. I collected several specimens and sent them to Loraine Yeatts at the Denver Botanic Gardens Kathryn Kalmbach Herbarium for verification. In addition, Loraine came to Sandstone Ranch to view the plants in person. She confirmed our identification and submitted one of the specimens to the Herbarium. The record of the acquisition, along with a photograph of the specimen, can be viewed in SEINet at ►

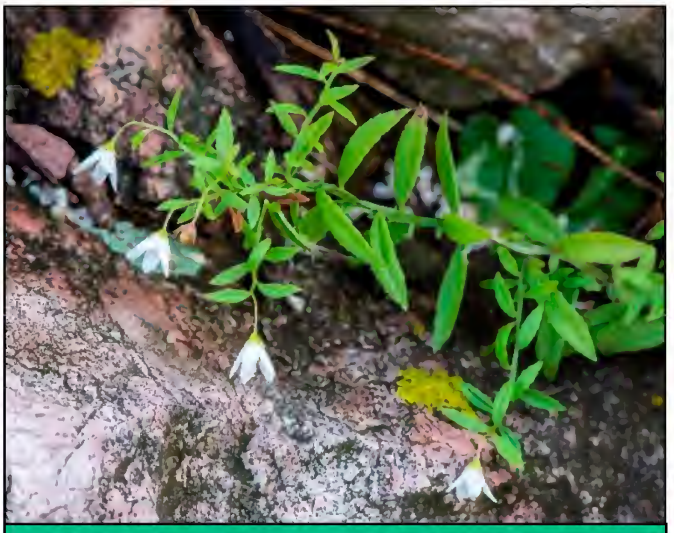
◄ http://swbiodiversity.org/seinet/collections/individual/index.php?occid=20503009&clid=0 Loraine also sent specimens to Ackerfield and Weber. We are indebted to Loraine for her kind assistance. The marsh bellflower is again a known flower in Colorado!

About Sandstone Ranch

In January 2018, Douglas County purchased Sandstone Ranch, its newest open space property. Sandstone Ranch is a beautiful 2038-acre ranch with a wide diversity of ecological zones and habitats, as well as red rock formations and historical and cultural assets. The property is considered to be the crown jewel of Douglas County's open spaces by many people who have visited. It is located along the foothills between Denver and Colorado Springs, just south of the Perry Park community. The property is currently closed to the public while Douglas County Division of Open Space planners work on its master plan, which will define how the ranch is to be developed for public use, while also ensuring valuable natural resources are conserved and protected. To read more about the property and follow the status of the master plan, go to https://www.douglas.co.us/dcoutdoors/openspace-properties/sandstone-ranch/

Sandstone Ranch Natural Resource Inventory

In March 2018, Douglas County Open Space volunteer naturalists initiated the Sandstone Ranch Open Space Natural Resource Inventory project to provide information to assist the planners in decision making as they develop the master plan. Jackie Sanderson, natural resource specialist for Douglas County Division of Open Space and Natural Resources, coordinated the field surveys and facilitated access to the ranch. Each week, volunteer naturalists inventoried animal and plant species in nine designated zones that encompass all habitat types within Sandstone Ranch. A volunteer team including CoNPS members and Colorado Native Plant Masters® was responsible for surveying the plants on the property. In addition, the CoNPS field studies committee sponsored two half-day plant inventories, and species observed during those events were incorporated into the overall Sandstone Ranch plant list.



***Campanula aparinoides* (marsh bellflower) was rediscovered in Colorado at Sandstone Ranch, Douglas County's newest open space. © 2018 Curt Frankenfeld**

In mid-October 2018, volunteer naturalists developed a report including lists of the plants and animals observed on each zone of the ranch, the general ecology of the habitats present, and identification of areas inhabited by sensitive species. The report was presented to the Douglas County Open Space Advisory Council and Douglas County Division of Open Space and Natural Resources staff members at a November 1, 2018 meeting. Volunteer naturalists are continuing surveys of plant and animal species on the ranch to support educational activities as well as ongoing decision making.

Elizabeth Taylor's father was a botany professor for over 40 years, but much to his dismay, she pursued college degrees in zoology, wildlife management, and technical communication and worked in those fields. It was not until she retired seven years ago that she finally started following in his footsteps and became a Native Plant Master® and novice NPM instructor. She will be co-teaching an NPM class at Sandstone Ranch in May 2019. ✵

A close-up of *Campanula aparinoides*, first collected in Colorado by Hall and Harbour in 1862. © 2018 Curt Frankenfeld

Featured Story

The Relationship between Native Plants and Their Native Pollinators

By Susan Carter

Native plants and native pollinators have close relationships, many of which we are still learning about. It always amazes me when someone helps connect the dots. I have always loved native plants, but I sometimes struggled with why they are so important—until two winters ago while attending Progreen Expo. At the event, I had a chance to hear Doug Tallamy speak about the relationship between natives and insects.

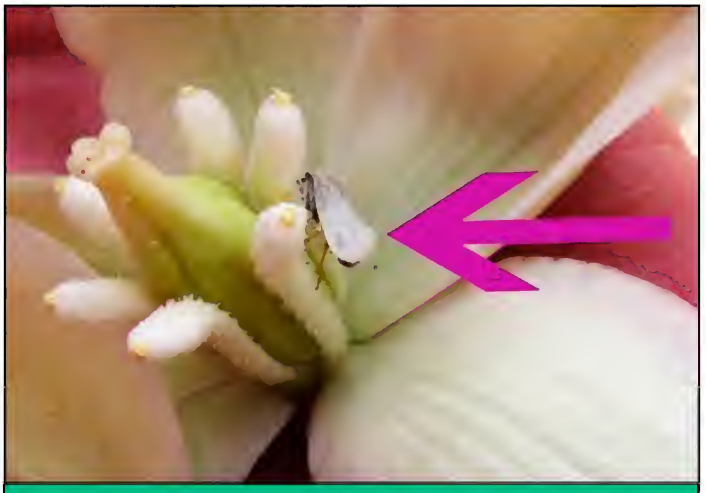
Tallamy is an entomologist and wildlife ecologist from the University of Delaware. He has done a lot of work on birds and their relationships with insects. He has written several books on the topic including *Bringing Nature Home: How You Can Sustain Wildlife with Native Plants* and *Pollinators of Native Plants*: *Attract, Observe and Identify Pollinators and Beneficial Insects with Native Plants*.

My favorite story is how he spent time observing a family of chickadees for an entire day. Mom and dad chickadee flew back and forth to a native tree, I believe an oak, and caught caterpillars, which they hauled back to their nest to feed the babies. The family ate over 200 caterpillars in one day. This made me realize that we should not worry about one insect on a plant! Since this was a native tree and native birds and a native insect, there is a relationship and balance built into the food web.

When we plant non-natives, they do not have pests for a while. Then, all of a sudden, an insect is imported that attacks the non-native tree and, with no natural enemies of the insect here, it becomes an epidemic. Thus, the relationships within the ecosystem can get thrown off.

Moths, Flies, and Bees—Oh My!

So what about pollinators? In the insect world, there are generalist insects and there are specific insects. Generalist insects pollinate many different families, genera, and species of plants. Specialist insects may pollinate just one species or genus of plant. For example, we have a native pronuba moth (*Tegeticula yuccasella*) that pollinates only yucca plants by laying an egg in the ovary of each flower. During this process the yucca is pollinated. The larvae then hatch and feed on the fruit of the yucca.



Yucca moth on yucca flower. Photo © Al Schneider, http://www.swcoloradowildflowers.com

The native *Gaillardia aristata* plant, or blanketflower, also has a specific moth pollinator: the painted schinia moth (*Schinia volupia*). The coloring of this moth matches the flower it pollinates, making the flower perfect camouflage for the moth. When hybrid gaillardias are used in the landscape instead of the native gaillardia, *Schinia volupia* can then be seen and eaten by birds, thus reducing the population of native pollinators necessary for pollinating native plants. ►

***Gaillardia aristata* with *Schinia volupia* moth. Photo © 2005 Charles Schurch Lewallen by www.BugGuide.net**

Syrphid flies like this one on a native buckwheat (*Eriogonum* sp.) favor plants of the Asteraceae family. Photo © Bob Hammon, retired CSU entomologist.

◄ Examples of generalist insects includes flies, but not just the typical housefly. Syrphid flies favor cholla, prickly pear, Utah serviceberry, Apache plume, and rubber rabbitbrush, as well as other plants in the Asteraceae family. Syrphid flies are reminiscent of hovercrafts and are important pollinators of flowers in the subalpine and alpine areas of our state. Native insects also like the flowers of cactus (*Opuntia*), larger penstemons, locoweeds and vetch (*Astragulus* spp), and sunflowers of the Asteraceae composite family like rubber rabbitbrush (*Ericameria nauseosa*).

Most people assume that the honey bee of the Apidae family is the only kind of bee in the US, but it is not even native to the US. There are seven families, 170 genera, and 4000+ species of native bees in North America. Identification can be difficult, and many bees have specific habits and host plants. In Colorado we have many local species—some prefer to be solitary while others live in groups. The honey bee can actually be territorial and displace our native bees.

This orange sneezeweed (*Hymenoxys hoopesii*) hosts a *Bombus sp.* on its disc flowers. © Susan Carter, Grand Mesa

Native bees are attracted to floral scents that humans consider pleasant and prefer a bright white, yellow, or blue flower with a landing platform like the tufted evening primrose (*Oenothera cespitosa*). © Al Schneider, http://www.swcoloradowildflowers.com

Bumblebees live in small colonies with a few being solitary. They feed on plants from February through November, so they need a variety of flowers to get them through those long months. When planting native plants in your yard, be sure to consider the whole season and install early to late bloomers. Some of the bee family's favorite flowers include goldenrod, iris, penstemon, and legumes. Some of our native bumblebees are listed as rare and we can help their populations by planting their favorite food sources.

There is much work to do to figure out which native pollinators favor our native plants. Be your own pollinator scientist. While looking at the wildflowers, look for the pollinators too. You may want to take one of Tallamy's books with you for a good read in the wild. Enjoy!

Susan Carter has always loved plants and has been working with them since eighth grade, leading to acquiring two related college degrees. She is the horticulture and natural resource agent, including Native Plant Master® leader, for Colorado State University Extension, Tri-River Area, which includes Mesa, Delta, Montrose, and Ouray counties. Her office is in Grand Junction. ✵

Corrections to Fall issue, Vol. 42 No. 5

The photo of Chief Arvol Looking Horse and Jim Tolstrup was missing a photo credit. The photo that appeared on page 11 is © Sandra Adams.

Credit was incorrectly attributed on page 13 for a group photo of attendees at the Red Mountain Open Space field trip. The photo is © Ronda Koski.

Featured Story

Trampling of Alpine Vegetation at Hoosier Ridge

By Mike Kintgen

This article originally appeared as a chapter of a larger master's degree project exploring what drives richness in Colorado's alpine tundra. In the final chapter, the author had to take an ethical stance on a subject studied during the program and weigh the benefits and cost to the stakeholders. This is that chapter. MM

The American West is an emblematic vacation and recreation region. The region is known for its grandeur, vast vistas, pristine forests, and meadows full of wildflowers, attributes which have contributed to a long history of public land use and also a need for conservation. The world's first national parks—Yellowstone and Yosemite—were founded in Wyoming in 1872 and California in 1890, respectively, and many more followed. These national parks and other public lands attract massive numbers of visitors each year. In addition to tourism, population growth has contributed to an increase in public land use, which directly corresponds with environmental degradation. This is evidenced in Colorado's delicate alpine areas, which are especially susceptible to human use. These areas have numerous stakeholders.

The damage caused by humans to alpine environments in the Colorado Rockies has long been recognized. One human activity that is responsible for damage to this life zone is foot traffic. In fact, a 1960s study by Willard and Marr in Rocky Mountain National Park found that alpine communities such as wet meadows, dry meadows, and fellfields are especially negatively impacted by foot traffic. This particular study was conducted on a fellfield community near a new parking area that opened on Trail Ridge Road in 1958. Twelve weeks into the study vegetation cover was only eighty-seven percent of what it was prior to the study, and just two years after the parking lot opened the vegetation cover was at thirty-three percent of its former cover. The plants that remained were primarily located in protected areas between or beside rocks. Interestingly, the species that sustained the most damage of all fellfield vegetation included the most compact cushion plants. Eventually, the area around the parking lot became a site with a high percentage of sand and gravel after the wind eroded the fine particles that had been held in place by vegetation (1970).

"Trampling…" *continued on page 10* ►

Hoosier Pass Stakeholders

Hoosier Pass serves a diverse range of stakeholders from the general public to governmental entities who manage the area for various recreational and economic activities such as hiking, off-road vehicle use, hunting, grazing, and urban and rural water resources. The area also provides a long list of ecosystem services that rely on intact and functioning natural plant communities. The values of the individual stakeholders are discussed below.

National Forest Resource Managers, Wildlife Managers, and Public Water Managers

These stakeholders are deeply impacted by use in national forests. They must determine what damage is being done, how much damage is occurring, and what resources are being affected, including any rare species that are being impacted. Resource managers and botanists have a legal and professional responsibility to safeguard the resources at hand and protect them not just for future preservation but also for future public use. Their findings and recommendations can set the stage for various management plans, or lack thereof, in these areas. Included in this group are timber managers and other resource managers for the forest service. Animal resources such as hunting and protection of Colorado's native fauna are important parts of what Colorado Parks and Wildlife does. These individuals have an agency goal to protect and manage Colorado's wildlife in a sustainable manner that safeguards the wild species and the resources that support the animals. Wildlife managers partner with hunters to control and thin animal populations.

Water managers for Denver Water and other water suppliers have an interest on how Hoosier Ridge is managed because destruction of vegetation can affect water quality and supplies. With increases in bare soil and erosion, more particulates are carried downstream in the water and runoff will occur more quickly and in higher volumes than on vegetated slopes and ridge lines. Less hiking, off-road vehicle use, and grazing will ensure that vegetation remains intact on Hoosier Pass. Employees of Denver Water have an interest in ensuring there is enough clean, usable water for customers in a growing population.

The stakeholders mentioned above have a responsibility to manage the natural resources in a way that allows revenue and resource extraction, while at the same time ensures that the public has minimal impact on these resources. The stakeholders below are members of the public or private corporations with interest in what natural areas have to offer.

Hunters

Hunters in turn value the ability to find the animals they are hunting. Reducing hiking, off-road vehicle use, and grazing allows more vegetation to support more game animals. Maintaining high concentrations of game open to ►

◄ licensed hunters is what this group values. Limiting hiking and off-road vehicle use will ensure that wildlife is driven to more remote areas. Both wildlife managers and hunters value wildlife for its beauty, importance, and the sporting opportunities that game animals provide.

Water Users

The residents in the metropolitan Denver area receive the vast majority of their drinking, irrigation, and household water from the central mountains of Colorado, which is served by Denver Water. Hoosier Pass sits in the middle of the water supply area. Denver Water customers want affordable, unrestricted amounts of safe, clean water for drinking, washing clothes, and watering their landscapes.

Mining companies

The Mosquito and Ten Mile ranges are heavy in minerals and have a long mining history and mining companies continue to have an interest in these areas. Mining companies value easy affordable access to minerals, so they can extract them. Employees of these companies are dependent on access to minerals. Mining companies were successful in blocking the implementation of a potential natural research area on Hoosier Pass in the early 1990s. One mining company was afraid that the creation of a natural research area would block access to minerals in the area. Mining on Hoosier Ridge would not only close the area to all users including hikers, ranchers, and hunters, but it also has the potential to pollute water supplies from destruction of vegetation cover and water contamination from the tailings. In the end, mining companies are dependent on access to mineral deposits to make profits.

Ranchers

Alpine areas are often used for grazing in the summer season once lower elevation vegetation dries and becomes unfit for grazing. Ranchers and livestock managers will move their herds and flocks to higher elevations and use grazing permits on public lands. Ranchers and livestock managers need access to these areas at the appropriate times of the year to feed their livestock. Peak hiking season and early hunting seasons overlap with prime alpine grazing times. Livestock owners and managers are ardent supporters of using public resources for the benefit of their livestock.

The Public (Hikers and Off-road Vehicle Users)

Hikers and off-road vehicle enthusiasts want easy and plentiful access to trails for recreational use. This group could be at odds with almost all the above groups for access and safety reasons because hunting and hiking on the same trail are not safe. Furthermore, hiking and off-road vehicle use damage vegetation that is valued by ranchers and water managers. This group of stakeholders—public land users—can roughly be divided into three groups: those for unregulated use of public lands, those for sustainable use, and those who are unaware of the damage they cause but with education would change their use to be more sustainable.

Citizens for Unregulated Use of Public Lands

This group believes that public lands belong to the American public and, as such, it is their right to have access and to use these areas responsibly. The Forest Service and Bureau of Land Management currently close certain roads and trails during seasons when foot, horse, or vehicle traffic might damage the trail or road, or when animal species might be using the area for breeding or raising young. There are people who feel that these areas should never be closed. At times these people will enter these areas despite postings and gate closures, by driving around gates, removing gates, or other means of entry. People who enter these areas illegally are often off-road vehicle enthusiasts. Other members of this group will respect postings and closings, but feel they are unconstitutional. This group values being able to use public lands at their discretion instead of at governmental discretion.

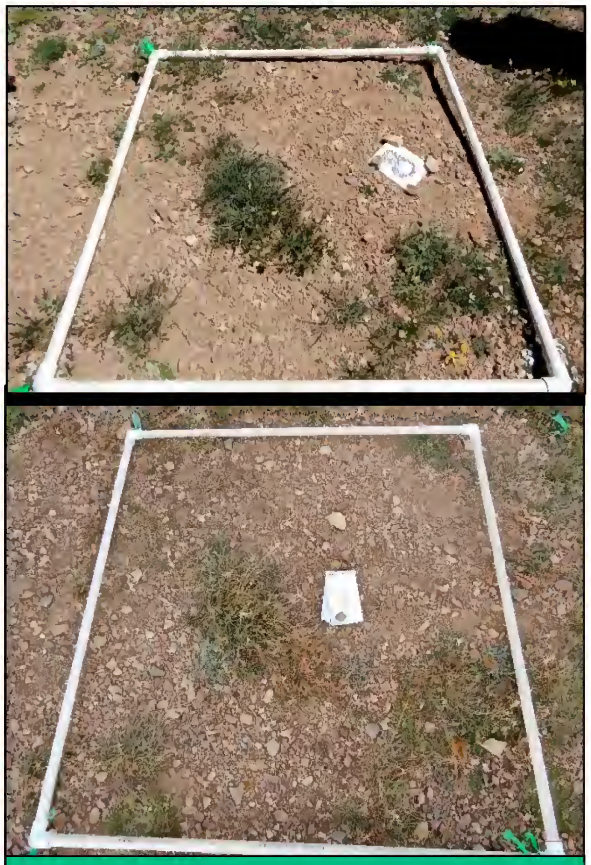
Citizens for Sustainable Use of Public Lands

There are also citizens who support and want to help protect resources and understand being excluded from areas that are too muddy in the early spring, areas closed for nesting (e.g. sandhill cranes), or areas that are closed to allow for revegetation to occur. This group of citizens use public lands in a way that protects the landscape and its resources for future generations.

Because Hoosier Pass is so botanically rich, a subgroup of citizens for sustainable use of public lands has emerged: botanists and wildflower enthusiasts. The destruction of native vegetation will affect these stakeholders because as biodiversity decreases, so does aesthetic quality. Perhaps most importantly to this group, Hoosier Ridge is known for some very rare or sensitive plant populations and an interesting assortment of high elevation plants. These stakeholders value responsible use of the area that safeguards the biodiversity at hand while allowing everyone the opportunity to see masses of wildflowers and rare species not seen elsewhere. Interestingly, a small subset of botanists and wildflower enthusiasts worked in the early 1990s to create the Hoosier Ridge Research Natural Area (Williams 1992), which never came to fruition due to mining company appeals.

Citizens Who are Unaware of the Damage They are Doing

While a bit more difficult to define than the above groups, these stakeholders are often visitors or newcomers to the American West. They have often come from areas that have no alpine communities and may be unaware of the damage their driving or walking off defined roads and trails may cause. These individuals are out to enjoy themselves and, often with some education, their use would fall into the above group of sustainable use.



Note the diminished vegetation of Plot 8 from June 26, 2018 (top) to September 15, 2018 (bottom). © Mike Kintgen

◀"Trampling…" *continued from page 8*

In addition to foot traffic, other harmful human activities include collecting rocks, which decreases wind protection; picking wildflowers, which reduces seed set; littering, which shades plants; and driving on the tundra, which tramples and often kills plants (1970).

Thirty-seven years after Willard and Marr's study, the researchers Willard, Cooper, and Forbes analyzed data collected between the years of 1959 to 2001 at the same alpine location. The data suggest that once vegetation was protected from human activities it did recover (2007). (These researchers defined recovery as an increase in vegetation cover.) However, Willard, Cooper, and Forbes noted that recovery was not the same across all plots and that the degree of winter snowpack and summer drought play an important role in the recovery process (2007). This is because heavy winter snowpack and summer drought shorten the already short alpine growing season, which further slows plant growth and recovery.

Although human impact to the alpine life zone has long been observed, there has been a minimal amount of scientific research done on this topic. This is, in part, because alpine areas are low in biomass and do not yield timber resources. However, the alpine provides important ecosystem services to humans, nonetheless. The researchers Johnson and Brown argue that perhaps the most important service is water retention, and intact vegetation is critical to ensuring an adequate water supply (1979). Indeed, alpine areas are particularly important for watersheds, because they release water later in the season (typically from June through August, but even through September) due to late melting snowfields (Johnson & Brown 1979; Martinelli 1975; Carrol 1976). Vegetation cover plays a pivotal role by slowing the water released by the melting snow and helping it to be absorbed by the soil and preventing erosion (Johnson and Brown 1979). Additional ecosystem services that the alpine provides include mineral extraction, game hunting, and grazing for livestock later in the summer after lower elevation pastures have dried up.

An area in Colorado that provides valuable ecosystem services is Hoosier Pass, located along the Continental Divide between the resort town of Breckenridge and the small town of Fairplay. An important area for several watersheds, the water on the west side of the Divide becomes the headwaters of the Blue River and drains directly into Dillon Reservoir, which Denver Water uses to supply customers in the Denver metropolitan area. The water on the east side goes directly into the South Platte, which flows through Denver and is also a water source for the Denver metropolitan area.

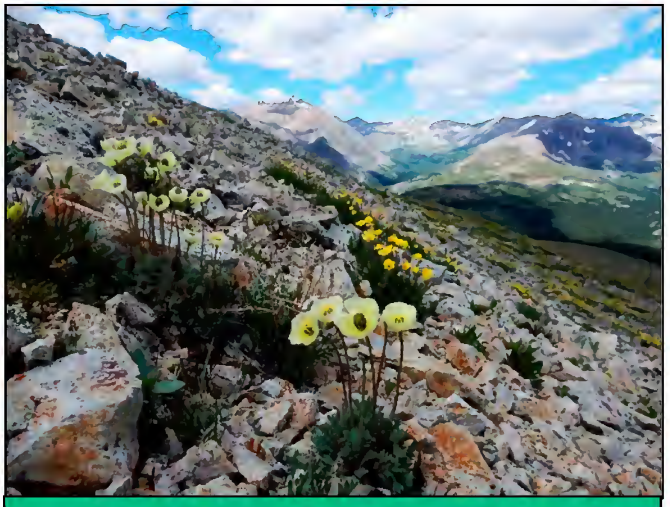
Hoosier Pass is also important because it is botanically rich. The area is noted for a high concentration of alpine flora, which includes both widespread species such as alpine avens (*Geum rossii*), alpine stitchwort (*Minuartia obtusiloba*), and alpine phlox ▶

An example of Weber's saw-wort (*Saussurea weberi*). © Kelly Ambler

◄ (*Phlox condensata*) and narrowly endemic species such as stalkpod locoweed (*Oxytropis podocarpa*), Weber's saw-wort (*Saussurea weberi*), and Leadville milkvetch (*Astragalus molybdenus*), the latter of which is endemic to central Colorado.

For his master's thesis, James Fowler looked at the alpine flora of the Southern Rockies. Fowler notes that 180 species have been documented just on Hoosier Ridge (2014). Furthermore, the north side of the ridge is the only site for sea-pink (*Armeria maritima*) in Colorado. Several other rare plants such as low northern rockcress (*Braya humilis*), boreal draba (*Draba borealis*), Porsild's draba (*Draba porsildii),* icegrass (*Phippsia algida*), alpine poppy (*Papaver radicatum* ssp. *kluanensis*), Weber's saw-wort (*Saussurea weberi*), Rothrock's Easter daisy (*Townsendia rothrockii*), and Hoosier Pass ipomopsis (*Ipomopsis globularis*) call this ridge home (Williams 1992).

This important area receives a considerable amount of vehicle traffic. Hoosier Pass is paved, which allows visitors easy access to elevations above 11,600 feet. Once above treeline, a 4x4 road allows more adventurous drivers access to an alpine ridge. The old Hoosier Pass, which is now used by off-highway vehicles, accesses the abandoned North Star Mine with additional smaller roads accessing various points around the mine. One of these social roads traverses a steep slope to the high point between the parking lot of Hoosier Pass and the North Star Mine. These roads have contributed to a considerable amount of trampling to the alpine communities on Hoosier Ridge.



Hoosier Ridge is home to the alpine poppy (*Papaver radicatum* ssp. *kluanensis*) seen here clinging to a rocky scree. © Mike Kintgen

I became aware of the damage to Hoosier Ridge during the summer of 2017 while conducting research on factors that drive species richness in Colorado's alpine vegetation. Hoosier Pass was one of my nine study sites, and during the growing season I visited plots on Hoosier Ridge three times: once on June 25, again on June 26, and finally on September 15. During this time, trampling and damage to the site was substantial: not only was the area trampled by repeated foot traffic, but it had also been driven over and possibly even used as a campsite. In fact, several of my individual plots could not be located because the landscape pins marking them had been removed by hikers or car tires.

The managers mentioned in the first section of Stakeholders must make decisions based on what is best for protecting the resources in question, protecting public safety, while also allowing people access to public areas and to recreational opportunities. Research examining the impacts of public use, and what types of public use are the least and the most damaging, helps policy makers create plans that serve everyone. Policy makers have a legal responsibility to do what is best for resources and the public. The stakeholder groups have different values and reasons for their actions. The recommendation below allows most groups to have some of their values integrated into the plan.

Recommendation

People have the right to access nature and to recreate in nature. Access to nature has been shown to have multiple health and social benefits for people by lowering stress, helping with developing empathy, and fostering an appreciation for nature. Furthermore, people who have access to nature are more likely to help preserve natural areas and biodiversity for the future. Thus, a compromise between allowing access to public lands and saving biodiversity and the ecosystem at Hoosier Ridge would be to allow access to some areas, while restricting foot and vehicle traffic away from the most sensitive areas of Hoosier Pass. Research suggests that closing certain damaged areas permanently to hiking and vehicles allows damage to stop and recovery to start.

For example, Willard and Marr's 1971 study demonstrates that areas that have been lightly trampled for a year or intermittently trampled for years might fully recover within four years. Areas that have experienced heavy foot traffic for twenty-five or more years could also start to recover in as little as four years (1971). However, areas that are heavily damaged may not show any signs of recovery in four years and instead may take hundreds and possibly a thousand years to recover to a climax ecosystem (1971). Thus, closing sensitive areas to general foot traffic and all off-road vehicle use will allow delicate alpine communities to recover, which fulfills the values of many of the stakeholders.

Studies support that restricting access to certain areas is effective. For example, in Willard and Marr's study, ►

◄ it has been demonstrated that when given a paved or restricted path, less than one percent of visitors will leave the path except near the parking area and at the end in order to get a better view (Willard & Marr 1971). Creating an area that is specific for foot or vehicle traffic and other areas that are just for foot traffic still allows people access to the tundra nature. In this scenario, hunters would have access to the area starting October 1, once peak hiking season is over.

Hunters will only be allowed access to those areas open to foot or vehicle traffic. Grazing should be discontinued on Hoosier Pass to protect the fragile vegetation and to create a safer environment for hikers. Closing the area to grazing could be unfortunate, as ranchers could use the forage this alpine area provides. The area, however, receives such heavy use that the benefits of closing the area to grazing outweigh the drawbacks. Additionally, placing signs at the parking area educating the public about fragile alpine ecosystems and this botanically rich and irreplaceable area could be helpful. Such signs exist on Shrine Pass near Vail and have helped keep foot traffic on designated trails.

While obtaining funding for such efforts is a common problem, there are local groups and societies that would likely donate for such a purpose, such as Colorado Native Plant Society, the Rocky Mountain chapter of the North American Rock Garden Society, and the Colorado Mountain Club. In fact, the Rocky Mountain chapter of NARGS helped fund a boardwalk across a wet meadow at Shrine Pass in the 1990s. The CMC also has a long history of public projects involving the improvement of trails and restricting foot traffic to designated trails. Working through these organizations helps ensure that people have the beneficial access to nature while preserving it for future generations. Managing these basic interests ensures the American West continues as an emblematic symbol of conservation and human enjoyment working side by side.

Damage to vegetation in Colorado's alpine tundra is a sizable problem: it reduces vegetation cover which negatively affects the ecosystem services alpine areas provide; specifically, water management, livestock grazing, game management, aesthetic value of natural communities, and endangered rare plant species. Creating specific access trails and road access while closing the area to grazing will allow public land managers to preserve vegetation cover while balancing the needs of the greatest number of stakeholders. Implementing the above plan will ensure plentiful, healthy game, and clean and safe water, while safeguarding rare or unique plants and a beautiful environment for all to enjoy.

Hoosier Ridge showing wear from vehicles and camping. © Mike Kintgen.

References

Carroll, T. (1976). An estimate of watershed efficiency for a Colorado alpine basin. In *Proceedings of the 44th Western Snow Conference, Calgary, Alberta*.

Dawson, C., Naumann, T., Gershman, M., Steinkamp, M. P., Williams, N., White, S., & Wittman, R. C. (1992). *Aquilegia*, Vol. 16 No. 5, September-October 1992: Newsletter of the Colorado Native Plant Society.

Fowler, J. F., Nelson, B. E., & Hartman, R. L. (2014). Vascular plant flora of the alpine zone in the Southern Rocky Mountains, USA. *Journal of the Botanical Research Institute of Texas*, *8*(2).

Johnson, D. A., Brown, R, W. (1979). Special management needs of alpine ecosystems. *Range Sci. Ser*, (5).

Martinelli, M. (1975). Water-yield improvement from alpine areas.

Willard, B. E., & Marr, J. W. (1970). Effects of human activities on alpine tundra ecosystems in Rocky Mountain National Park, Colorado. *Biological Conservation*, *2*(4), 257-265.

Willard, B. E., & Marr, J. W. (1971). Recovery of alpine tundra under protection after damage by human activities in the Rocky Mountains of Colorado. *Biological Conservation*, *3*(3), 181-190.

Willard, B. E., Cooper, D. J., & Forbes, B. C. (2007). Natural regeneration of alpine tundra vegetation after human trampling: a 42-year data set from Rocky Mountain National Park, Colorado, USA. *Arctic, Antarctic, and Alpine Research*, *39*(1), 177-183.

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How Photosynthesis Works

By David Julie

Almost all life on earth depends on a few stops in energy's journey from sunlight to heat. Let's explore the manner in which photosynthesis in plants converts light energy into energy stored in chemical bonds.

Recall from chemistry and physics that atoms contain uncharged neutrons, positively charged protons, and negatively charged electrons. Neutrons and protons are relatively heavy and are clustered in an atom's nucleus. Extremely light electrons move exceedingly rapidly in space around the nucleus. Atoms try to fill that space by sharing electrons with other atoms to form molecules.

In the first step of photosynthesis, light strikes an antenna system composed of pigments. Whereas most objects that absorb light convert the light's energy directly into heat, which simply means that the objects' atoms or molecules move or vibrate faster, the pigments of the antenna system capture the light's energy and transfer it to a reaction center. In plants, each antenna system contains thousands of pigment molecules—especially chlorophyll, which contains a central magnesium atom. Chlorophyll absorbs blue and red wavelengths of visible light. Chlorophyll reflects green wavelengths.

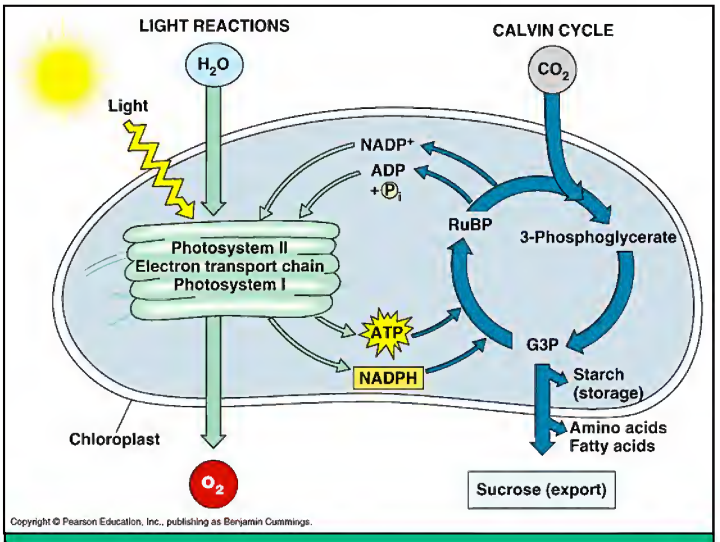
In the first component in the reaction center, called Photosystem II, the energy delivered by the antenna system dislodges and energizes electrons from two special chlorophyll molecules. A water molecule (H_2O) held in a manganese frame splits so that the hydrogen atoms' electrons can replace the electrons that were dislodged from the chlorophylls. Protons from the hydrogen atoms spill onto one side of a membrane.

The electrons energized by Photosystem II pass through a reaction center sequence whose components use energy from the electrons to pump more protons onto one side of the membrane. Eventually, the difference in concentration of protons separated by the membrane becomes analogous to compressed air in a tank. Protons relieve the differential by flowing through and physically turning an enzyme in the membrane that assembles ATP (adenosine triphosphate) as it revolves.

Now depleted of energy, the electrons pass to Photosystem I, whose name reflects that it was discovered before Photosystem II. Light again strikes the antenna system, which absorbs the light's energy and delivers it to Photosystem I. Photosystem I energizes the electrons and binds them with protons to reconstitute hydrogen atoms and places the atoms in temporary holders named NADPH; the last letter denotes hydrogen.

In the light-dependent steps to this point, the plant has split H_2O, released the oxygen, held the hydrogen atoms in NADPH, and stored a lot of energy in ATP and NADPH.

Next, the ATP and NADPH pass into the fluid outside the membrane that contains the antenna complex and reaction center. There, a light-independent sequence of chemical reactions called the Calvin-Benson-Bassham cycle uses the energy from ATP and NADPH to bind the hydrogen from NADPH with carbon and oxygen in carbon dioxide (CO_2) to form carbohydrates ("carbo" denotes carbon, "hydr" denotes hydrogen, and "ate" denotes oxygen). The plant has captured the energy from light and stored it durably in the chemical bonds of a sugar.



The stages of photosynthesis. © Pearson Education, Inc. publishing as Benjamin Cummings

The biochemical innovations that perform photosynthesis developed in bacteria long before plants existed. Bacteria boast a diverse array of photosynthetic mechanisms, including some that do not split water and do not liberate oxygen. However, not coincidentally, the photosynthetic mechanisms of cyanobacteria closely resemble those of plants. Genetic evidence supports Lynn Margulis's contention that a chloroplast, the organelle in plant cells that performs photosynthesis, is the evolutionary vestige of a cyanobacterium that was incorporated into another organism. ►

Monarch (*Danaus plexippus*) larva accessing the sun's energy via showy milkweed (*Asclepias speciosa*). © David Julie

◄ Organisms store energy in a range of chemical compounds. ATP offers fast access but poor durability. Simple sugars resist breakdown better by more tightly securing the energy they store. Starches and fats store energy more compactly than simple sugars.

Most cellular processes can only be powered by ATP. So, photosynthetic organisms convert light energy into chemical energy stored first in ATP, which are then transferred to more permanent repositories like sugars, starches, and fats. Then, almost all organisms employ mechanisms like aerobic respiration or fermentation to transfer energy from these more permanent repositories into ATP that powers their cellular processes, such as muscle contraction.

Peter Mitchell revealed that, in both photosynthesis and aerobic respiration, organisms use an energy source to pump protons across a membrane creating a differential. In photosynthesis, organisms use light as the energy source to pump protons. In aerobic respiration, organisms use energy released from sugars to pump protons. The ATP generated as protons relieve the differential provides the energy for life's many activities. Those activities in turn convert most of the energy to heat, completing the journey of energy that started as sunlight.

Background

Lynn Margulis described the endosymbiotic theory for the origin of chloroplasts and mitochondria in an article titled "On the Origin of Mitosing Cells" in the *Journal of Theoretical Biology* in 1966.

Peter Mitchell was awarded the Nobel Prize for chemistry in 1978 for discovering the chemiosmotic mechanism for ATP synthesis.

Photosystems I and II are names given to the groups of molecules that perform the functions described in this article. The name of the component between them is less universally accepted and is referred to as a "sequence" in this article for simplicity.

David Julie and his partner Kate Goes In Center do not see a contradiction in both loving plants and eating them. David loves reading innovative science books including Nick Lane's Life Ascending, *Siddhartha Mukherjee's* The Gene, *and Penny LeCouteur's and Jay Burreson's* Napoleon's Buttons. *You can reach David at bldrjardin@live.com* ✵

Test Flora ID Skills Using Online Flash Cards

The Intermountain Region Herbarium Network is one of ten portals, or online databases, featuring digital specimens and observations of Colorado flora (and all of the Great Basin flora) accessible by the public and scientific community.

Visit the site daily at http://intermountainbiota.org/portal/ for an opportunity to learn about a Plant of the Day. The site asks only for family name and species in the two-question quiz. Website visitors can provide either or both answers or "give up" to view the answers to the daily quiz.

A more challenging plant identification option is also available on demand. Select Colorado Floras under the Flora Projects option on the left side of the home page. For example, click on "CoNPS: Eastern Colorado Prairie Ranchlands Flora near Wray, Northern Chapter Field Trip 2016" and a complete specimen list for a June 11-12, 2016, field trip is displayed. Test your skills by clicking on the Games and Flash Card Quiz option next to the field trip name.

There are nine other databases that address flora for other parts of the country. SEINet and Symbiota sponsor these integrated databases and are supported by the National Science Foundation. The Arizona – New Mexico chapter of SEINet covers the southwestern region of North America, including Colorado. Access SEINet at http://swbiodiversity.org/seinet/index.php/

Conservation Corner

Pawnee National Grasslands: An Important Conservation Area for Colorado's Biodiversity

By Crystal Cogar

The US Department of Agriculture Forest Service administers twenty publicly owned National Grasslands totaling almost four million acres (USDA, 2018). Seventeen of the National Grasslands are located east of the Rocky Mountains, from the badlands of North Dakota to north-central Texas and into the Great Plains. One such USDA Forest Service administered National Grassland—Pawnee National Grassland, Fritz Knopf Prairie —is located northeast of Denver in Weld County near the Wyoming and Colorado border. The Pawnee National Grassland is composed of 193,060 acres and is administered by the Arapaho-Roosevelt National Forest Rocky Mountain Region.

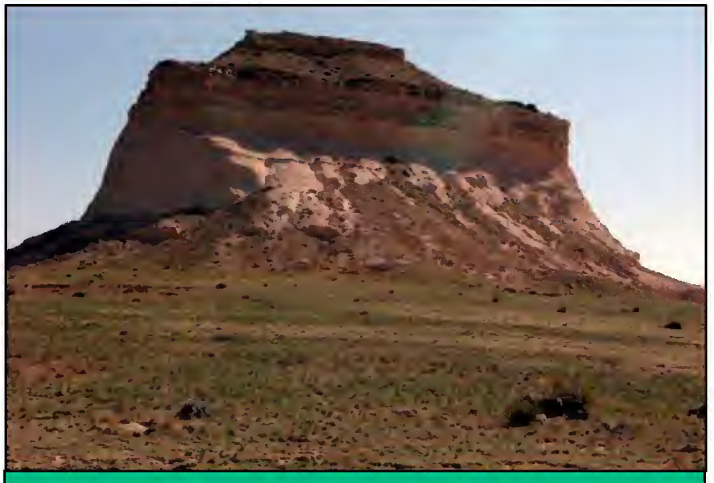
While Pawnee National Grassland is administered as a grassland conservation area containing native grasslands, it also provides public recreation opportunities and is an internationally known birding area that supports many bird species, particularly during migration. Major breeding areas exist at Pawnee National Grasslands for the mountain plover (*Charadrius montanus*) and Colorado's state bird, the lark bunting (*Calamospiza melanocorys*), is very common on the grassland in spring and summer.

One notable geomorphologic feature occurs in Pawnee National Grassland. That feature is Pawnee Buttes, sedimentary rock formations situated one-half mile apart that rise 350 feet above the plains to an elevation of 5,375 feet (USDA, 2018). The tops of the buttes are only about 250 feet above the plains surface, but because of their isolation, they are a well-known landmark. They have avoided the erosive forces that lowered the sediment layers of the surrounding areas, probably due to a slightly thickened or erosion resistant cap rock (Hazlett, 1998).

The most common habitat on the Pawnee National Grassland is open steppe (Hazlett, 1998). The dominant plant species are blue grama (*Bouteloua gracilis*) and, to a lesser extent, buffalo grass (*Buchloë dactyloides*). Other characteristic plant species of open steppe habitat are purple three awn (*Aristida purpurea*), fringed sagebrush (*Artemisia frigida*), rabbitbrush (*Chrysothamnus* sp.), snakeweed (*Gutierrezia* sp.), ring muhly (*Muhlenbergia torreyi*), plains prickly pear cactus (*Opuntia polyacantha*), western wheatgrass (*Pascopyrum smithii*), and scarlet globemallow (*Sphaeralcea coccinea*) (Hazlett, 1998).

There are two Colorado Natural Heritage Program mapped and assigned Potential Conservation Areas in Pawnee National Grassland: Pawnee Grassland East and Pawnee Grassland West. The PCAs highlight areas in the state contributing to Colorado's biological diversity, and their boundaries encompass rare species and natural plant communities, and reports often contain valuable information on ecological conditions, unique ecological communities, and management recommendations (CNHP, 2018). According to CNHP, both PCAs within Pawnee National Grassland have a High Biodiversity Significance Rank (B3) primarily for McCown's longspur (*Rhynchophanes mccownii*), chestnut-collared longspur (*Calcarius ornatus*), and mountain plover, and include known occurrences of rare grassland birds (CNHP, 2018). CNHP assigns biodiversity significance ranks to PCAs using a 1 to 5 ranking system, with 1 being globally outstanding to 5 being locally significant.

The CNHP PCA report for Pawnee Grassland East indicates the land cover is approximately 84 percent grassland or mixed grasslands with forbs and cacti with small patches of mixed shrubland and agricultural lands. Pawnee Grassland East consists of Great Plains mixed grass prairie of sideoats grama (*Bouteloua curtipendula)*, little bluestem *(Schizachyrium scoparium)* and golden buckwheat *(Eriogonum flavum)*. Other communities of conservation priority in the area include coyote willow (*Salix exigua*), bare ground, wet meadows with Nebraska sedge (*Carex nebrascensis*), scarp woodlands with Rocky Mountain juniper ►



Pawnee Buttes looms on the Pawnee National Grassland, Fritz Knopf Prairie. © Crystal Cogar

◄ (*Juniperus scopulorum*) and little bluestem (*Schizachyrium scoparium*), foothills riparian shrubland with chokecherry (*Prunus virginiana*) and wild plum (*Prunus americana*), and wolfberry (*Symphoricarpos occidentalis*) shrubland.

Bird species documented in Pawnee Grassland East, in addition to the grassland birds identified above, include burrowing owl (*Athene cunicularia*) and ferruginous hawk (*Buteo regalis*). Black-tailed prairie dogs (*Cynomys ludovicianus*), an important food source for raptors and predators like the swift fox (*Vulpes velox*), have also been observed. In addition, an uncommon butterfly, the rhesus skipper (*Polites rhesus)*, has been recorded from the plant community.

A wooded draw at the Pawnee National Grassland. © Crystal Cogar

Pawnee Grassland West is 86 percent native grasslands or mixed grasslands with forbs and cacti, also with small patches of mixed shrubland and agricultural lands according to the CNHP PCA report. Numerous state vulnerable plant communities in the area include shortgrass prairie with blue grama (*Bouteloua gracilis*) and fourwing saltbush (*Atriplex canescens*), wet meadows with Nebraska sedge (*Carex nebrascensis*), salt meadows with desert saltgrass (*Distichlis stricta)*, clustered sedge wetland with clustered field sedge (*Carex praegracilis*), common three-square bulrush (*Schoenoplectus pungens*), Nuttall's biscuitroot (*Lomaticum nuttallii*), plains milkvetch (*Astragalus gilviflorus*), alpine feverfew (*Parthenium alpinum*), and mountain cryptantha (*Oreocarya cana*)—all state rare plants—have also been recorded from this PCA. Similar to Pawnee Grassland East, burrowing owl and ferruginous hawk have been documented, and black-tailed prairie dogs serve as an important prey base. Recent records of northern leopard frogs (*Lithobates* [*Rana*] *pipiens*), a former federal proposed threatened species, have also been documented.

Pawnee National Grassland is an important area for the conservation of Colorado's native grassland and the wildlife that inhabit it. It is the goal of the US Forest Service to preserve this conservation area from industrial development. However, programs such as CNHP also support the USFS's goal of conserving Colorado's biodiversity through surveys, monitoring, GIS databases, and maps which assist landowners, land managers, and land users to make informed choices allowing people to pursue their livelihoods while maintaining the state's natural character and conserving biological resources where development is proposed outside of public lands and conservation areas.

Biological resources in Weld County and northeast Colorado are threatened by development due to the oil and gas and renewable energy industries. In 2017, Weld County was the number one oil producing county with 91% of Colorado's oil production. Weld County also had a record high production year as the number one natural gas producing county in Colorado (Weld County, 2018). Wind energy resources also occur in northeast Colorado where existing wind farms scatter across the land and new wind farms are proposed. These development activities can have an impact on grassland habitats in multiple forms if not monitored and mitigated by county zoning commissions, landowners, and land agencies.

Measures to minimize impacts and protect grassland habitat during construction and operation of these facilities can be implemented including the following:

- Reclaiming temporary disturbed areas post-construction through de-compaction, re-grading, and re-planting or seeding with appropriate species;
- Siting of infrastructure to avoid all sensitive vegetation areas including important riparian and wetland habitats;
- Developing and implementing a noxious weed management plan including monitoring, treating, and documenting noxious weeds throughout construction and operations;
- Encouraging the clustering of oil and gas drill and well sites or placing wind turbines in strings whenever possible;
- Utilizing existing roads to provide access during construction and operations to avoid new road creation;
- Implementing best management practices to limit the loss of soil through wind and water erosion;
- Supporting the responsible use of dryland grass areas for ranching, farming, mineral extraction, and other beneficial uses;
- Supporting the private use of the federal Pawnee National Grassland through grazing options and other mechanisms that preserve the public benefit of the grassland, while still allowing responsible grazing management; and

"Pawnee Buttes…" *continued on page 33* ►

Garden Natives

Sphaeralcea coccinea, Scarlet Globemallow

By Jim Borland

Unknown to this writer is the reason that so many flowers are known as scarlet, crimson, or cardinal in color when the flower color is really "orange." Such is the case with scarlet globemallow, also known as red falsemallow, scarlet mallow, and red star mallow. Copper mallow, yet another common name, is, perhaps more descriptive, and the name cowboy's delight more fanciful and imaginative.

Regardless of its name, this mallow may be the toughest of all mallows, growing in the wheel ruts of dry, shortgrass prairie roads with its strong, deep taproot (to 8 to 13 feet) and its running rhizomes. Aside from roadbeds and roadsides, scarlet mallow is found naturally in disturbed sites, on dry hills, in grasslands, on mesas, and on prairie hardlands from southern British Columbia to Manitoba south to Oregon, Utah, Texas, Iowa, and Arizona. Occupied soils range from light sandy or rocky to dense clays with a pH of 5-8.

Emerging in April to May, this 4- to 8-inch tall perennial in Colorado spreads to form extensive colonies of green to gray pubescent, deltate to suborbicular divided leaves peppered with dense clusters of salmon to orange colored flowers.

Throughout its range, the amount of natural precipitation necessary to keep it in peak form varies, depending upon locale, but many consider it to be one of the most drought resistant perennials of the Great Plains.

The greatest roadblock to propagation is the lack of available seed in large quantities, especially viable seed, since it is often infested by weevils (look for a tiny, tiny hole in the seed). The second roadblock is germination that can be overcome with scarification. But no easy or convenient means is available to accomplish this latter task on a large scale, unless you consider drilling a very small hole in the seed coat as more than one source suggests. A few growers have succeeded with rhizome cuttings in spring, but large number increases by this means are improbable. Even very young cuttings may be used for rooting, but results vary with each grower or batch of cuttings.

In the container, seedlings or larger plants present no special problems if extra attention is paid to higher levels of soil aeration than is commonly done. Cold hardy to zone 3b (-30 to -35F°) at least, scarlet globemallow is not a plant for confined areas. It has the ability to travel under four feet of concrete sidewalk, so give it plenty of room and allow it to ramble at will throughout the planting area.

Jim has been fooling around with native plants for more than 40 years in private, commercial and public venues. His home garden contains thousands of native plants, most grown from seed at home and now not supplementally watered for 20 years. Jim has written hundreds of articles, given talks too numerous to count and continues to grow and plant the two or three native plants not yet in his garden. ✵

Scarlet globemallow (*Sphaeralcea coccinea*) is known to occur in each of Colorado's 64 counties. According to Montana Fish, Wildlife, and Parks, this native to the western states was collected by Meriwether Lewis on July 20, 1806, along Montana's Marias River. The plants gathered and recorded by the Corps of Discovery were stored in many places over the years, but now reside in Lewis and Clark's Herbarium at The Academy of Natural Sciences of Drexel University in Philadelphia. See http://fwp.mt.gov/education/youth/lewisAndClark/plants/scarlet.html Photo © Kelly Ambler

Restoration Roundup

Rebuilding the Dolores River Riparian Corridor with Native Plants

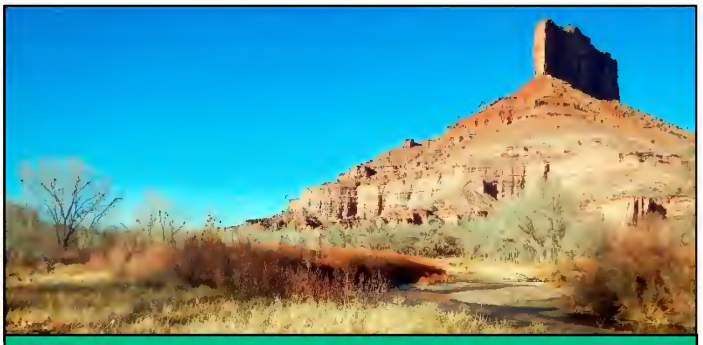
By David Varner

Although the focus of my work is environmental conservation, there are only a couple days out of the year I actually get paid to install a native plant—I relish them. I considered myself pretty lucky in November when I got down on my knees to demonstrate how to take a young shadscale (*Atriplex confertifolia*) out of its plastic pot and put it in the recently watered hole without breaking off the top. So lucky, in fact, that I waxed a bit eloquently, relishing the moment the root ball touched the moist soil at the bottom of the hole, declaring this would be the plant's new home. Too eloquently, apparently, because after enjoying that moment I looked up to my audience to see some high schoolers rolling their eyes. I don't take it personally. I know my passion for native plants and high quality riparian habitat is outside the bell curve when it comes to amusement. But I also know feedback when I see it, so I moved on to the next step in the process and began pushing the dirt back in the hole, anchoring the sapling shrub's rootball in its new geography.

Atriplex confertifolia, you say? Riparian? Well sort of, right? If you're confused, then it might help to learn something about the Dolores River and the effects of decades of reduced flows into it. Without getting too controversial, a dam was constructed in the 1980s where the Dolores River transitions from a steep, headwaters stream in the Colorado Rockies to a low-gradient desert river. A substantial portion of the water collected by that dam is diverted out of the watershed for agriculture and other needs. In-stream flows for the actual river channel were overlooked. If the tamarisk infestation was not significant prior to the 1980s, the new conditions created by the water management were ideal for the invasive phreatopyhte, further outcompeting the willow and cottonwood for space and moisture. Add to the recipe a lack of hydrologic disturbance over several decades, and the result is a fixed river channel with dense tamarisk infestations armoring the banks. The Dolores River Canyon was always beautiful, but the riparian corridor became inaccessible as native vegetation cover and riparian habitat quality declined.

The Dolores River Restoration Partnership (DRRP) started in 2009 as a way to reverse the degradation of the riparian corridor of the river, in the service of ecological as well as social and economic objectives. Private funders pumped resources into the partnership's efforts, and a lot of headway was made removing tamarisk infestations from the river banks and floodplains over several years. In some places, native plants recolonized sites, but at many locations, native riparian plants did not fare well; these sites eventually became infested with Russian knapweed or other invasive plants with the ability to take advantage of the harsh conditions. Partnership efforts to perform active revegetation yielded mixed results. The result of this history is a 200+ mile river corridor with a desiccating, hydrologically disconnected, and disturbed floodplain, river banks armored with native and non-native shrubs, and undersized flows in the channel. While tamarisk infestations persist in difficult-to-reach and challenging-to-treat areas, it has been nearly eradicated from some reaches, the result of a multi-layered, integrated pest management approach. DRRP continues to address tamarisk where it's reasonably feasible, and now is turning more attention to areas where tamarisk has been removed, but a (relatively) stable native vegetation community has not yet been achieved. Revegetation of the Gateway Canyons Restoration Site is one such effort. DRRP has been actively stewarding the site since 2016, with annual revegetation efforts and seasonal weed treatments. ►

Plants Used in This Restoration Project
Alkali sacaton (*Sporobolus airoides*)
Fourwing saltbush (*Atriplex canescens*)
Gambel oak (*Quercus gambelii*)
Gardner's saltbush (*Atriplex gardneri*)
Great Plains false willow (*Baccharis salicina*)
New Mexico privet aka desert olive (*Forestiera pubescens*)
Rabbitbrush (*Ericameria* sp. or *Chrysothamnus* sp.)
Sand dropseed (*Sporobolus cryptandrus*)
Shadscale (*Atriplex confertifolia*)
Silver buffaloberry (*Shepherdia argentea*)
Three-leaf sumac (*Rhus trilobata*)
Winterfat (*Krascheninnikovia lanata*)



The restoration site at Gateway Canyons.
© David Varner

◀ So, on a Friday in November, carefully scheduled as late in the fall as possible to guarantee winter moisture while still accommodating Gateway School curriculum, community members and other partners gathered to plant several hundred native plants at three sites on a broad floodplain of the Dolores River downstream of Gateway, Colorado. With resources provided by Bureau of Land Management, National Wild Turkey Federation, Mesa County, Gateway Canyons Resort, and RiversEdge West, students and volunteers installed one-gallon container plants, grown expressly for the site, reflecting a range of moisture associations from mesic to xeric. Project managers may not know exactly what the future hydrologic regime of the Dolores River will be, but they are confident it is likely to be drier than the past and are selecting plants that can take advantage of such conditions: such as Great Plains false willow (*Baccharis salicina*), fourwing saltbush (*Atriplex canescens*), rabbitbrush (*Ericameria* sp.), and others.

With many of the holes pre-dug by Gateway Canyons Resort's landscaping crew, volunteers and students learned the protocol and put it into action: make sure the hole is deep enough and pre-water it; remove the plant's pot without breaking off the tip and place it in the hole; tamp down the fill dirt when half-full and then again when full to make sure all the air pockets are collapsed; form a mounded ring around the drip-line to capture future precipitation, and then water, and water again. Conversations, demonstrations, and competitions ensued, time flew by, and by early afternoon our work was done. Many hands made light work of clean up. In the end, three sites, newly planted with native vegetation, were added to the three-year maintenance schedule for DRRP habitat restoration crews who will address seasonal weed treatments and irrigate the plants during dry periods.

If degradation of our environment has happened in thousands of ways, big and small, at millions of locations over the vast landscape of the American West, then it stands to reason that restoration needs to happen in that same manner. These sites on the Dolores River are some of those efforts. These locations are being set on a new ecological trajectory

Flagging marks the site of freshly planted natives and allows for easier monitoring in subsequent seasons. © David Varner

—one that can withstand changing environmental conditions and provide wildlife habitat, recreational opportunities, and pride in the communities it supports. This project's leaders, partners, and volunteers are investing in a valuable resource and working hard for the day when this shared vision is realized.

At the end of the event, Gateway Canyons offered everyone at the event a tour of their jaw-dropping auto museum, making for a fun, social, and cleaner way to end the day.

Partners in this ongoing project include major funders such as National Wild Turkey Federation and Bureau of Land Management, as well as the myriad others without whom this project would not have been possible, including: Gateway Canyons Resort provides site access and labor (its landscape crew donates invaluable efforts maintaining the sites); Gateway School and Mesa County Valley School District 51 contributes student participation and curriculum integration; Mesa County Weed & Pest provides labor and technical support; community volunteers from Grand Junction, Whitewater, and Gateway do the bulk of the sweating on planting days; and RiversEdge West coordinates the Dolores River Restoration Partnership.

Gateway students were just one of the partners in the restoration project. © David Varner

David Varner works in applied ecological restoration on Colorado's West Slope. With experience on river restoration projects throughout the western US, he works with RiversEdge West in Grand Junction to design and implement sustainable riparian conservation projects. He has worked in a variety of freshwater habitats in the Great Basin and Pacific Northwest, as well as charitable natural resource conservation projects in South Asia, Mexico, and the American West. David also served a term on the board of California Native Plant Society and as president of the San Diego chapter. David recognizes the vital contribution that planting and fostering native plants in suitable locations (ideally on protected land!) is toward environmental restoration. His current focus on the intersection of native plant landscaping and wildland restoration informs that strategy.

An avid recreationist, David loves to explore Western Colorado and beyond- by bike, hike, ski, boat, and book. His latest favorite outdoor pastime is sharing it with his toddler daughter. You can contact him at dvarner@riversedgewest.org ✵

Research and Reports

Notable New Caryophyllaceae of the Southern Rocky Mountains

By Mathew T. Sharples

While working on *Stellaria* (the starworts, close relatives of *Cerastium*, the chickweeds) of the southern Rocky Mountains and beyond, I happened upon an unusual collection from Boulder County housed at the University of Colorado herbarium (COLO). Part of my work in *Stellaria* has involved writing a dichotomous key to the native species occurring in Colorado (Sharples and Tripp, in press). I have noticed while working in various northern hemisphere herbaria that the *Stellaria borealis* – *Stellaria calycantha* (the boreal starworts) species group bears much morphological variation across its circumboreal range.

I have never encountered species referable to these names in the field before, and therefore the hardest part about writing a key to the southern Rocky Mountains stars was determining how many "*borealis*-like" species occur in the region. Ultimately, I found it best to simply refer to this group as the *Stellaria borealis* complex in the key, as it was not clear in the COLO collections that more than one entity in this widespread species complex occurs in Colorado. Instead, I found that characters separating the putatively distinct *Stellaria borealis* and *Stellaria calycantha* in Colorado can be observed on the same specimen, suggesting that these characters might reflect within-population morphological variation of a single evolutionary lineage in the region.

These two species were originally described from different continents, and consequently the two may not be co-distributed in Colorado, pending additional morphological and molecular investigations. Whichever lineages exist in Colorado in this complex, these plants bear leafy bracts and solitary flowers as their axillary inflorescences.

I came across something distinct in one of the *Stellaria calycantha* folders at COLO, however. One specimen was neither attributable to *S. calycantha* nor *S. borealis*, as known across their global distribution. The specimen had multi-branched axillary inflorescences with scarious bracts, characteristics that I was familiar with from a species I knew in the field from Eurasia (Figure 1; full specimen viewable on the SEINet herbarium portal, COLO-473384). I recognized *Stellaria alsine* Grimm (bog starwort) based on these and other characters, a species whose closest known localities lay in Minnesota and Washington (Morton, 2005). This specimen was collected nearly 20 years ago (late June 1999) by Nan Lederer (with Bill Jennings) in a "peaty fen" north of Nederland in Boulder County. A duplicate of this specimen was also deposited at Denver Botanic Gardens (full specimen viewable on SEINet, KHD-33665).

Figure 1: A pair of scarious (papery) bracts subtending axillary cymes of *Stellaria alsine* is indicated by the arrow. The presence of scarious bracts subtending axillary cymes (in combination with other characters) easily distinguishes *S. alsine* from other starworts in Colorado.

I am unaware of other records of this taxon from Colorado right now, but I suspect that other records must already exist somewhere filed under different names and/or at different herbaria, particularly at those institutions located in the local southern Rockies region. The Boulder County collection represents the only known locality of *Stellaria alsine* in the entirety of the Rocky Mountains at present.

Based on the high-quality native habitat implied on the collection label as well as the moderately high elevation of collection, it is probable that the *Stellaria alsine* record from Boulder County represents a native member of the southern Rocky Mountains flora. However, given the propensity of some members of *Stellaria* to be weedy and ruderal, and given the proximity of the collection locality to human settlement and disturbance, it is possible that this plant has ►

◄ been introduced to Colorado in recent times. Populations of this species in eastern North America are considered to encompass its native distribution, while populations on the west coast of North America and in South America are thought to represent anthropogenic introductions (Morton, 2005). These hypotheses of native status are equivocal, however, and no molecular work has been conducted to test whether or not any of the North American populations are native or introduced.

Discovery of more populations of *Stellaria alsine* in the southern Rockies region combined with inferences from habitat and ecology from descriptions on collection labels may one day better clarify this entity's native status in Colorado.

Dr. Erin Tripp and I also propose a nomenclatural change in the native *Stellaria* flora of Colorado in forthcoming work (Sharples and Tripp, in press). *Stellaria irrigua* Bunge, first reported in North America as being disjunct between the Altai Mountains and the southern ranges of the southern Rocky Mountains (Weber, 1961), was discovered by us (and hypothesized by previous Russian investigators: see Kozhevnikov, 1994) to represent an earlier synonym of *Stellaria umbellata* Turcz. Our results indicated that the taxon being identified under the name *Stellaria irrigua* in Colorado was a distinct endemic species that represented an evolutionary offshoot of a more widespread species, and which was previously first described in P.A. Rydberg's *Flora of Colorado* (1906) as *Alsine polygonoides* Greene ex Rydberg.

We have proposed this entity as *Stellaria sanjuanensis* M. Sharples and E. Tripp, reflective of its nexus of distribution and original description locality in the San Juan Mountains of southern Colorado. It is distinguished from what is commonly referred to here in Colorado as *Stellaria umbellata* (now synonymous with *Stellaria irrigua*) by its fleshiness, its anthocyanin-rich shoots, its solitary inflorescences with leafy bracts, its flowers with conspicuous petals, and not least of all, its narrow restriction to well-drained alpine screes and tuffs of usually volcanic origin (Figure 2). This latter habitat requirement is in marked contrast to the well-watered habitats required by true *Stellaria irrigua*.

Figure 2: *Stellaria sanjuanensis* (A) and *Stellaria irrigua* (B). A: *Stellaria sanjuanensis* is anthocyanin-rich, fleshy, petalous, and bears solitary axillary inflorescences subtended by leafy bracts. B: The inflorescence of *Stellaria irrigua*, as in *S. alsine*, is subtended by scarious bracts, and the terminal inflorescence of this species branches in a "sub-umbellate" manner. The leaves are bright green and petals are absent in *S. irrigua*. Image is excerpted from Sharples and Tripp, in press.

References

Kozhevnikov, Y.P. 1994. Caryophyllaceae, pp. 10–35 in: Grubov, V.I. (ed.), *Plants of Central Asia*, vol. 11 [English Translation from the Russian]. Enfield: Science Publishers.

Morton, J.K. 2005. *Stellaria* (Magnoliophyta: Caryophyllidae, part 2)., pp. 96–114 in: *Flora of North America Editorial Committee* (eds.), *Flora of North America north of Mexico*, vol. 5. New York: Oxford University Press.

Rydberg, P.A. 1906. *Flora of Colorado*. Fort Collins: Experiment Station.

Southwest Environmental Information Network, SEINet – Arizona Chapter. 2018. Available at http://swbiodiversity.org/seinet/collections/index.php

Sharples, M.T. and Tripp, E.A. 2018. RAD Sequencing Rejects Long Distance Disjunction in *Stellaria* (Caryophyllaceae) and Yields Support for a New Southern Rocky Mountains Endemic. *Taxon*, in press.

Weber, W.A. 1961. Additions to the Flora of Colorado: **Stellaria irrigua* Bunge in America. *Univ. Colorado Stud., Ser. Biol.* 7: 12–15.

Mat Sharples is near the end of his PhD work at the University of Colorado, where he has been raised under the mentorship of COLO curator Dr. Erin Tripp. He specializes in floristics, the Caryophyllaceae, and systematic biology generally, and is currently exploring finer-scale topics within the genus Stellaria. *Contact him at mathew.sharples@colorado.edu or via his website https://mathewsharples.com/*

CoNPS Seeks Board Members

CoNPS is seeking candidates for the position of member-at-large on the society's board of directors. Candidates should submit a short biography and reasons for wanting to serve on the board. Candidates will be considered and will be selected by vote of the board in the spring. Submissions are due March 1.

Members-at-large sit on the board and hear topics and issues pertinent to the organization. They are voting members and are encouraged to serve on committees. Members are expected to attend all board meetings or assign a proxy. Additional information is available on the CoNPS website under bylaws.

Questions? Contact Tom Zeiner at tzeiner303@gmail.com

News and Announcements

Year-end Committee Reports

Following are reports from some of the CoNPS committee chairs for work completed in 2018.

Conservation Committee

by Linda Smith, committee co-chair

The Conservation Committee has had a very productive year writing comment letters, signing on co-agency comment letters, giving public testimony, and advocating on behalf of CoNPS chapters. Many of these items are posted on the CoNPS website.

Comment Letters Written

- January 27: Grand Mesa, Uncompahgre & Gunnison National Forest - Draft Forest Assessment Identifying and Assessing at-Risk Species.
- April 6: BLM - Environmental Assessment for the September 2018 Competitive Oil and Gas Lease Sale (leases for sale in vicinity of several rare plants, and close to Sand Dunes National Park). Update: Drilling Decision Delayed on Land near Great Sand Dunes National Park (BLM September 2018 Oil/Gas Lease Sale for leases in Huerfano County Deferred for Now).
- June 1 - Grand Mesa, Uncompahgre and Gunnison National Forest Service – Forest Plan Revision, Scoping Process.
- August 31 – CoNPS Opposes Village at Wolf Creek Development within Rio Grande National Forest.
- September 1-11 – Ten CoNPS volunteers write letters to the BLM Royal Gorge and Uncompahgre Field Offices opposing the sale of oil and gas leases in the BLM December 2018 lease sale. Eleven leases potentially endangered one rare plant and six rare plant communities in the Pawnee Grasslands and Purgatory Canyon and five leases potentially endangered two rare plants and three rare plant communities in Gunnison County.
- November 2 – In the second half of the December 2018 Oil and Gas Lease Sale, another 82,000 acres were offered, and the public comment period stared on November 2. The CoNPS Conservation committee wrote public comment opposing the sale of eight leases due to the presence of rare plants. Two other letters were written by CoNPS volunteers objecting because the leases impacted CNHP Potential Conservation Areas. The volunteers were in the process of writing four more letters, but the sale was abruptly reduced due to pressure from Governor Hickenlooper, who opposed the sale of 74,000 acres because the BLM had not completed their Environmental Assessment. All leases the Committee opposed were removed from the sale.
- November 21 – Grand Mesa, Uncompahgre and Gunnison National Forests comment letter for the Monarch-Marshall Pass Vegetation Management Project proposal, advising the USFS to provide special attention to the fens and fen hydrology in this area, and to conduct field surveys for several rare plants and mosses that are known to be in the area. Comment letter drafted by Gay Austin.
- November 28 – CoNPS Conservation Committee members are in the process of writing individual comment letters for the BLM March 7, 2019 Oil and Gas Lease Sale, objecting to the sale of particular leases where rare plants are known to occur.

CoNPS signed on to other agency comment letters

- May 3 - Comment letter to BLM State Office regarding implementation of Zinke's new Oil and Gas Leasing Instructional Memorandum, which would significantly reduce the extent and time frame for public input.
- May 4 – CoNPS joins other groups to oppose Forest Provisions in Federal Farm Bill HR2 which, among other things, would double the amount of logging allowed without review and disclosure of potential harms.
- May 7 - Defenders of Wildlife Comment Letter: 'Please Oppose the "Poisoned Pollinator Provision" in the 2018 Farm Bill'. This provision would gut longstanding requirements to ID and minimize impacts to endangered species caused by pesticide products, limiting spraying pesticides in key areas where endangered species live. It would also remove the requirement of the Endangered Species Act for the Environmental Protection Agency to consult with wildlife agencies on the impact of pesticides on endangered species prior to use.
- May 24 – Grand Mesa, Uncompahgre & Gunnison National Forests– Forest Plan Revision Scoping Comments for Timber and Vegetation Management and Fire Management – Letter originating from Rocky Smith, Forest Management Analyst.
- June 1 – Grand Mesa, Uncompahgre & Gunnison National Forests– Forest Plan Revision Scoping Comments for Rangeland Management and Livestock Grazing – Letter originating from Rocky Smith, Forest Management Analyst.
- June 5 – CoNPS opposes the inclusion of HR 520, the National Strategic and Critical Minerals Production Act of 2017 in the National Defense Authorization Act. ►

- ◄ June 12 – CoNPS signs on to an organizational letter drafted by the Wilderness Society opposing US Senate "Wheels Over Wilderness" Bill.
- June 21 – CoNPS signs on to letter from Defenders of Wildlife opposing all major environmental riders in the National Defense authorization Act for Fiscal Year 2019 (HR 5515).
- June 25 – CoNPS signs on, along with 352 other groups, to request a sixty-day extension of the public comment period for the recently noticed Advance Notice of Proposed Rulemaking on the "Update to the Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act."
- July 1 – CoNPS signs letter of support for preservation of South Canyon near Gunnison which is in danger of being developed. The South Canyon Coalition is in the process of trying to convince the City Council to buy the property to protect it from development.
- July 17 – Sign-on Letter from Defenders of Wildlife to the Environment and Public Works Committee Opposing Senator Barrasso's Endangered Species Act Rewrite.
- August 16 – CoNPS signs on to the NEPA Advance Notice of Proposed Rulemaking (ANPRM). Letter originated from the Center for Biological Diversity and represents the collective responses of hundreds of public interest organizations.
- September 11 – CoNPS signs on to a letter to Michael Bennet and Cory Gardner expressing strong opposition to Senator Barasso's draft legislation entitled the "Endangered Species Act Amendments of 2018" that would essential weaken the ESA. Letter originating from Defenders of Wildlife.
- October 10 – CoNPS signs on to the 'Defending the Roadless Rule" to Secretary Purdue submitted by Rocky Mountain Wild.

CoNPS gave public testimony

- September 5 – At the Jefferson County Board of Appeals Mo Ewing testified against the Ken Caryl HOA's construction of a bicycle trail through an Aspen/Beaked Hazelnut rare plant community. The board ruled to allow the trail to be built.

In addition to signing on to upcoming agency comment letters of critical concern, the conservation committee will focus its efforts on:

- Reviewing and commenting on the BLM Quarterly Oil & Gas Lease Sales;
- Continued commenting for the ongoing Forest Plan Revision for the Grand Mesa, Uncompahgre & Gunnison National Forests, and the Rio Grande National Forest; and
- Providing committee members with additional state and federal agencies/issues to monitor, including individual USFS Schedules of Proposed Actions.

With the help and approval of Colorado Natural Heritage Program, four Important Plant Areas have been chosen and submitted to Native Plant Conservation Campaign for their nationwide IPA program. Informational data sheets for the IPAs will be on our webpage soon, with photos.

Advocating on behalf of chapters

One of the goals of the conservation committee is to provide advocacy support for each of our chapters. The conservation committee is in the process of gathering links for local boards and committees for chapter members to monitor in each major community throughout Colorado. Links are available currently for the Boulder area and the Fort Collins/Loveland area: https://conps.org/aa-conservation-website-links/

The Boulder and Northern Chapters have already undertaken some advocacy projects on their own:

- Boulder chapter: Erica Cooper, chapter president: On March 29, Erica sent a Comment Letter in Response to City of Boulder 'System Overview Report'. *More Info*: https://bouldercolorado.gov/osmp/osmp-master-plan-whats-ahead
- Northern chapter: Hugh Mackay, chapter president, has developed a very successful advocacy program for his chapter. Members have volunteered to monitor every advisory board in Larimer County, Loveland, and Fort Collins. While monitoring the Loveland Open Lands Advisory Committee (OLAC) meetings, Nan Daniels and Curt Cole were asked by OLAC if CoNPS would advise them about a project at one of their open spaces involving the planting of native plants. Since then, Kathy Maher has volunteered to be the lead for this project, and has submitted designs for two small areas using plants that have been shown through SEINet to be within a 10-mile radius of the site. The chapter has been awarded a $3,000 grant from Open Lands Program Small Grants for Community Partnering from Larimer County to help cover the expenses (Loveland will cover the rest). Northern chapter members will oversee the project for the next one to two years. Signage will be at each location with the CoNPS logo. In the meantime, because of this new partnership, the City of Loveland recently asked CoNPS to provide a 'reference' letter for them when it applied for a Great Outdoor Colorado grant. This letter was written and submitted by Maddie Maher, VP of the northern chapter, and approved by Mo Ewing, conservation committee chair. Full circle – advocacy works!

To join the conservation committee, please email Mo Ewing, conservation committee chair, at bayardewing@gmail.com ►

Horticulture Committee

By Ann M. Grant, committee chair

This year the restoration and horticulture committees were formally split into two committees following the informal practice of operating separately for a couple of years. We are still finding our feet and have much important work to do. In 2018, we launched a pilot program in the Northern chapter called Monitoring Native Plants in the Garden. The purpose of this project is to eventually provide bloom times, general growing conditions, and other cultural information about natives that are being grown in garden settings across the state. Members who signed up for this project collected information on natives throughout the season. This winter we are planning to sharpen the focus in preparation for a state-wide launch, with more input to the data sheets (this is your chance!), more training sessions, and on the ground help for gardeners in getting started with the monitoring.

For another committee project, BethAnne Bane designed and implemented a program for CoNPS Certified Native Plant Gardens with three levels: silver, gold, and platinum.

Information for both programs can be found on the CoNPS website. Contact Ann Grant at odygrant@gmail.com to join the horticulture committee or to help with Monitoring Native Plants in the Garden. Contact BethAnne Bane at bethannebane@gmail.com for information on getting your native plant garden certified.

Another important project we need help on includes revisiting the CoNPS mission statement. As a society, we also need to tackle the issues of rare plants in commerce and the planting of native cultivars and subsequent impacts on native pollinators, insects, and bird populations.

Education and Outreach Committee

By David Julie, committee chair

Thanks very much to the CoNPS members who shared their knowledge and appreciation of Colorado native plants with the public. Here's what the committee accomplished this year.

February

- Tom Zeiner gave a slide show about native plants to the Green Mountain Seed Exchange.
- Renee Galeano-Popp and Alice Guthrie selected four student projects for CoNPS awards at the regional Longs Peak Science and Engineering Fair in Greeley.

March

- David Julie presented a Habitat Hero - Wildscaping program at the Morrison Nature Center in Aurora.

April

- Lenore Mitchell gave a presentation about planting a bee-friendly native plants garden at the Denver Public Library / Ross-University Hills Branch.
- Kate Goes In Center and David Julie gave a program for children and adults about flowers, bees, and wasps at Sandstone Ranch in Longmont.
- David Julie gave a program about flowers, pollinators, and caring for the planet to three 3rd grade classes from Rangeview Elementary in Severance.

May

- Ann Grant and Kate Goes In Center staffed a CoNPS booth at the High Plains Environmental Center during the CoNPS Plant Sale distribution.
- David Julie gave a program for children and adults about flowers and pollinators at HPEC on the same day.
- Amy Yarger gave a program about poisonous and dangerous plants to a Boy Scout troop in Erie.

June

- Kate Goes In Center and David Julie gave a program about flowers and pollinators at the Poudre River Festival in Fort Collins
- Kate Goes In Center and David Julie gave two youth programs about wildflowers and pollinators at the Catamount Institute field science camp near Colorado Springs

July

- Jim Pisarowicz presented a program about photographing native plants through the seasons to a high country gardening club.

August

- Art Clifford staffed a CoNPS booth at the Honey Festival in Parker.
- Lenore Mitchell gave a presentation about Colorado native wildflowers at the Anythink Library in Thornton; Lenore donated the honorarium to CoNPS. ►

Art Clifford at a CoNPS booth at the Honey Festival in Parker. © David Julie

◀ September

- Jim Tolstrup gave a presentation about the use of Colorado native plants by Native Americans to the Johnstown Historical Society.
- Jim Tolstrup provided guidance about design and educational features to the Bluff Lake Nature Center.

October

- Ronda Koski gave a presentation about native plants at the annual meeting and graduation of the Laramie County Native Plant Masters® in Wyoming.
- John Vickery organized and recruited speakers for the Colorado Weed Network Fall 2018 meeting.

November

- Tom Zeiner, Jack Carter, Jennifer Bousselot, and David Julie staffed a CoNPS booth and gave a program about including native plants in the classroom at the Colorado Science Conference in Denver. Tamar Krantz, Lenore Mitchell, and Amy Yarger contributed photographs for the slide show, which is being made available to teachers.
- John Vickery represented CoNPS during a panel discussion at the Colorado Pollinators Network Summit in Denver.

Restoration Committee

By Erica Cooper

The Restoration Committee hopes to be more active in 2019! We will complete a focus statement, as well as publish a list of resources for members and the public to use to plan their restoration project. The Committee is looking for a representative to attend the High Altitude Revegetation Conference, or sponsor the registration fee for a member to attend. Please contact Erica at emcooper8@gmail.com for more information, for general Restoration Committee questions, or to join the committee. ✵

Memorial for Ron Hartman,

February 8, 5:30 PM

A memorial for Dr. Ronald Hartman will be held on February 8 at the University of Wyoming, Berry Biodiversity Conservation Center at 5:30 PM. All are invited to attend.

In Memoriam

Donald Lavern Hazlett, of Pierce, Colorado, friend, mentor, teacher, passed away at home on January 5, 2019.

Don was born in 1949 in Pueblo and grew up on a farm outside of Fowler where his love for native plants began. After receiving an MS in botany from South Dakota State University, Don served in the Peace Corps from 1970-1975 in Honduras where he led the construction of the herbarium at the forestry school, and later worked at a research station in Costa Rica. Don wrote a book on the history of the gardens he lived and worked at, as well as the ethnobotany surrounding them. It was during his time in Central America that Don obtained his doctorate from the University of Washington in forestry ecology, and discovered two new plant species, one which was later named after him: *Haptanthus hazlettii*. This was also the period of time when he and Marta married and began a family.

After moving his family back to Colorado, Don worked on a research station on the Pawnee Grasslands and later ran his own business, New World Plants and People, providing consulting and education services. He also worked as a consultant for the forest service as an expert on the plants of the western grasslands and compiled the flora of the Pawnee, Kiowa, and Rita Blanca National Grasslands.

Don was one of the early presidents of CoNPS, and a very active member of the Northern chapter, attending chapter meetings, leading field trips, and presenting state-wide workshops mostly on ethnobotany. He received a Lifetime Achievement Award from CoNPS in 2018. CoNPS is extremely thankful to Don and his family for their decision that memorial donations be made to the John Marr Fund, a lasting and meaningful tribute to the native plants and habitats that Don loved. We'll all miss Don's expertise and wealth of knowledge, his glorious sense of humor, and his friendship.

Portions of this article have been excerpted from Don's obituary in the January 8, 2019, issue of Greeley's *The Tribune* at https://www.greeleytribune.com/news/obituary-for-donald-hazlett/

2019 Event Calendar

(Please check the Events Calendar at https://CoNPS.org for updated information and registration.)

Chapter Meetings

Boulder Chapter Meetings: 2nd Tuesday of the month (usually), Boulder Rural Fire Station, Gunbarrel, 7–8:30 PM
Feb 12: Mathew Sharples, University of CO, Boulder "Stellaria (Caryophyllaceae)"
Mar 12: TBD
Apr 9: TBD

Metro-Denver Chapter Meetings: 2nd Tuesday of the month (usually), Denver Botanic Gardens, Plant Society Building; 6:30–8:30 PM
Feb 12: Jack Carter, PhD Professor Emeritus, "210th Year Celebration of Charles Darwin's Birthday." Join us to celebrate the birthday of Charles (the same day as the birth of Abraham Lincoln). Enjoy birthday cake, a glass of wine, and a lecture on the life and times of this powerful individual who contributed so much to science and our understanding of the natural world.
Mar 12: Scotty Smith, Colorado native orchids
Apr 9: Scotty Smith, Colorado native ferns, including Botrychiums

Northern Chapter Meetings: 1st Tuesday of each month (usually) at the CSU Tamasaq Event Center, 4825 West County Rd 52E in Bellvue, 6:30 PM Social, 7-8:30 PM meeting
Feb 5: Bryan Fischer "New Plantings at the Gardens on Spring Creek: The Selection and Propagation of Natives."

Plateau Chapter Meetings
Events TBD

Southeast Chapter Meetings: 1st Thursday of each month, 6-7:30 PM
Feb 7: Maggie Gaddis, New Southeast Chapter President, "Native Grass ID with Dried Specimens" Bring your magnifying devices. Get prepared to look at some ligules. Bring your book suggestions, presentation ideas, and a potluck item that involves any derivative of grains. Attendees will help plan future meeting topics. RSVP to Maggie Gaddis at ecocitycoloradosprings@gmail.com

Southwest Chapter Meetings: Lyceum Rm., Center for Southwest Studies, Ft. Lewis campus, 6:30-8:00 PM
Events TBD

CoNPS Board Meetings:
Anyone can attend the society's board meetings.
Saturdays, 10 am to 1 pm; February 2, April 27 August 17, and November 16
Boulder County Fairgrounds, Longmont

CoNPS Workshops

Introduction to Colorado Wildflowers from Plains to Peaks
March 9; 9:30 AM to 12:00 PM
Boulder Rural Fire Protection District Community Rm
6230 Lookout Road, Boulder (Gunbarrel area)
Presenter: Mo Ewing, plant ecologist

Become acquainted with the wonderful world of Colorado wildflowers and get started on developing skills to identify different species found in the Boulder area. In the first section our slide show, we will discuss how plants are named and identified, review basic plant morphology, and look at the characteristics of the thirteen most common plant families. After a short break, we will take a tour of the most common plants you are likely to see in Boulder, the foothills, montane, subalpine and alpine, identifying some of the most wonderful places to hike and what wildflowers you are likely to find there.

Mo Ewing is a retired Plant Ecologist with an MS in conservation biology from Antioch New England in New Hampshire. He presently is a CoNPS board member and chairman of the conservation committee. He also volunteers in the research lab of Denver Botanic Gardens and the Colorado Natural Areas Program. Previously, he was the land stewardship director at Colorado Open Lands, a state-wide land trust. His interests range from mapping native plant communities to developing an interactive key to the moss genera of Colorado.

Colorado Cacti
March 16; 9:30 AM to3:00 PM

Rocky Mountain Arsenal NWR Contact Station
Presenter: Scotty Smith
Scotty's presentation will be filled with numerous pictures and slides of nearly all the approximately 25 native cacti species and varieties found throughout Colorado. This class is appropriate for participants from all levels of experience and interest in native Colorado cacti.

The following three workshops are part of a series, designed for people interested in learning more about creating native plant gardens. Attend one, two, or all three workshops.

Why Go Native? Benefits and Beauty
March 23; 9:30 AM to 12:00 PM
Jefferson County Extension Office
Presenter: Irene Shonle

Discussion will include importance of planting natives as well as other benefits of going native. Focus includes landscape considerations, and what to plant for color, texture, and more to maintain interest in the garden all year long, while providing food for native pollinators and birds.

Soil Science Basics and Tour of CSU's Soil, Water, and Plant Testing Lab
March 30; 9:00 AM to 3:00 PM
CSU, Fort Collins
Presenters: Jim Ippolito and Jim Self

Learn the basics from Dr. Jim Ippolito as he provides information regarding soil science, including how soils form, soil color, texture, and clays; soil water, organic matter, and pH. With this, attendees will better understand what affects plant growth in different soils found in their backyards and across landscapes. Dr. Jim Self will give a tour of the CSU Soil, Water, and Plant Testing Laboratory.

Do It Yourself Landscape with Natives
April 6; 9:00 AM to 3:00 PM
South Platte Park - Carson Nature Center, Littleton
Presenter: Beth Hanson

Learn basic design principles and put them to use in your own landscape. The day will include a tour of the Carson Nature Center's native plant garden with a focus on design and Front Range/Foothills plant selection, a friendly student-led group critique of an existing park landscape, a "how-to" indoor presentation, and an eight-minute one-on-one chat with Beth about your personal landscape. Learn general and specific suggestions for your site. Plan and plant your landscape for beauty and durability using Colorado native plants.

Cross-Pollination Events

Crested Butte Wildflower Festival
By Tom Zeiner

Here's some pretty bold language for a little town at the end of the road: "Wildflower Capital of Colorado." That was the title bestowed on Crested Butte by the state legislature in 1990 due to the spectacular display of wildflowers that occurs here each summer. This little valley that sits at 9000' is a gateway to a variety of ecosystems allowing hikers to find a huge array of native plants within a short distance. Whether it's alpine, montane, or sagebrush steppe, it's all close to Crested Butte.

The Crested Butte Wildflower Festival was started in 1986 as a three-day event, and has now expanded to ten days with over 200 offerings. The mission of the Festival is simply to advocate for the preservation and appreciation of wildflowers. To accomplish that, we offer a wide range of events, some with a botanical emphasis, others to learn more about alpine environments, geology, photography and medicinal native plants. This year, we will initiate a children's program so kids can learn and be entertained while Mom and Dad go for a hike.

We're not just about hosting events, though. The education piece of our mission is important for the whole year. We offer information for native plant lovers year-round, including free wildflower guides (check the website under the INFO tab), advice about where to find the best wildflower displays, and simple steps you can take to help us preserve our native wildflowers. Although the festival is held during the "peak" wildflower season, if you only come during early July, you'll miss the best early displays of lupine and red columbine, or the fireweed and gentians of late summer. We can provide you with information about where things are blooming best whenever you're in town and can arrange a guided hike outside festival time.

If you are interested in a guide to show you some trails you're not familiar with, that's our specialty. Hikes range from easy 1-mile ID walks near town to longer hikes on more remote trails. Geographically, we cover an area from the west side of Kebler Pass to the valleys near town to the west side of Schofield Pass, and even over West Maroon Pass to Aspen. ►

◀ We look for and retain leaders who enjoy sharing their knowledge. They have expertise in native plants, butterflies, and history, and also include artists and herbalists. We are always looking for new leaders who can share their knowledge with our guests. If you are interested in becoming a workshop leader, please contact us with your ideas.

One of the best ways to learn about the festival and be the first to register for events is to become a member. Membership starts at $25. It's a great way to become involved and learn about our goals and initiatives.

We look forward to having you visit us this summer. Be sure to stop into the festival office and let us know about your adventures in the Wildflower Capital of Colorado! Learn more at https://www.crestedbuttewildflowerfestival.com

CoNPS member Tom Zeiner is a member of the Crested Butte Wildflower Festival board of directors.

APS Holds Annual Meeting in NW Colorado

The American Penstemon Society will host its 2019 annual meeting in northwest Colorado May 31 to June 3. Registration is limited. The meeting includes multiple field trips to see penstemons near North Park, Kremmling, and State Bridge. Habitats visited will include sagebrush steppes, sand dunes, fens, montane and subalpine forests. Evenings will feature lectures in Walden.

APS advertises that there will be opportunity to see the following penstemon species: *P. cyathophorus, P. saxosorum, P. rydbergii, P. radicosus* (potentially), *P. virens, P. harringtonii, P. osterhoutii,* and *P. penlandii* (if permission is granted by landowner).

For more information, visit http://penstemons.org/index.php/annual-meetings

***Penstemon cyathophorus* is one species typically blooming in Walden where the APS meeting will be held May-end. © Mike Kintgen**

Working with Natives in the Name of Wildlife

March 7, 5:30-7:00 PM
Kenton J. Seth – Presenter
Ross- University Hills Branch Library, Denver

Learn about the most important and forgotten ways native plants can be used to help critters, but focus on practical and realistic considerations for us normal human beings so that we can get the most from "low hanging fruit" when it comes to hosting nature in our home gardens. We're much more apt to do a good job if it's easy! Register online at https://act.audubon.org/onlineactions/yv_3fLfR5Ui7eip93ijFSQ2

High Altitude Revegetation Conference

March 12-14
Colorado State University, Fort Collins

Jointly hosted by High Altitude Revegetation Committee (HAR) and Central Rockies chapter of the Society for Ecological Restoration (CeRSER), the goal of the 2019 Conference is to enhance understanding of ecological restoration and revegetation in diverse ecosystems using a variety of methods. For more information, visit the website at https://sites.warnercnr.colostate.edu/restoration-conference

Western Landscape Symposium

March 30; 9 AM to 3:00 PM
Pueblo Community College, Pueblo

The 13th annual Western Landscape Symposium will be held Saturday, March 30, 2019. The Symposium will be held at Pueblo Community College in the Fortino Ballroom. Advance tickets are $20.00 and can be purchased online at https://www.eventbrite.com/e/2019-western-landscape-symposium-tickets-54555007496 or purchase tickets (with cash or check) at CSU Extension-Pueblo County, 701 Court Street, Suite C, Pueblo, CO 81003. Tickets will not be available at the door and this annual event sells out. For more information, call (719) 583-6566.

Boulder-Denver City Nature Challenge 2019

Colorado Parks and Wildlife needs help documenting biodiversity in the Boulder-Denver Metro Area to compete in a worldwide Bioblitz against over 120 other cities on six continents. The 2019 Challenge will take place from April 26 to May 5.

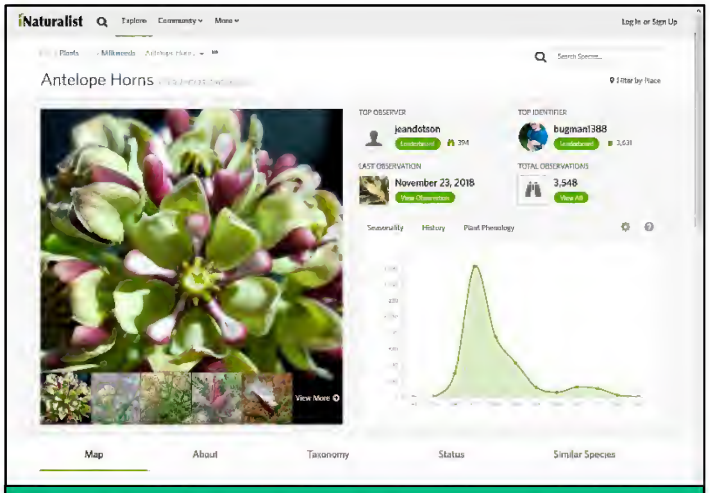
Observations can be collected using iNaturalist April 26-29 and identified through May 5. The challenge encompasses Adams, Arapahoe, Boulder, Broomfield, Clear Creek, Denver, Douglas, Elbert, Gilpin, Jefferson, and Park Counties. Contact Kent Schnacke at kent.schnacke@state.co.us for more information.

Media Review

iNaturalist: It's a Natural! By Suzanne Dingwell

Have you heard of iNaturalist, but for any number of reasons you haven't climbed on board yet? Even without creating an account or joining, you, along with researchers everywhere, have access to most of the data recorded by the organization. iNaturalist provides open data to the public, including conservation organizations, governmental agencies and database collections of many stripes from local to international.

To look at results, you don't even need to be an official user. Let's try it together using some specific characteristics of one of Colorado's native milkweeds, such as antelope horns (*Asclepias asperula)*. Type iNaturalist, Antelope-Horn in the search bar of your desktop computer or smart phone search engine. Select the first search result that starts with Antelope Horns (*Asclepias asperula*) iNaturalist.org.



Bingo! You will see beautiful photos of the plant in all stages of its growth from bud to seed set, leaf venation, plant form, and flower structure. You also get a map of where it has been seen, and a record of its phenology. Reporting a protected species? You can obscure the maps for the listed species you want to protect. Plants that appear in these collections have been certified as "Research Grade," but more on that later. These results are the input from iNaturalist users!

But, never fear, you do NOT need to be a great photographer to participate in iNaturalist. Most of the photos on iNaturalist are average, at best, and some are downright lousy. The purpose is to learn and share, not to enter a photo contest.

You also do not need to know what plant you are posting. One of the best things about iNaturalist is getting help with species identification. If you are in the field and have good connectivity, you can post your photo real time with one click, and get ID suggestions sometimes immediately. Help comes in two ways: by image recognition in the software or by peer review.

Image recognition has become amazingly good as the database has grown. It is not, of course, completely accurate every time. The second way involves the participation of other iNaturalist participants, who make suggestions about ID, and either confirm or disagree with an ID you have made. Once two people have agreed on the species ID, it becomes Research Grade and is entered in the collective database.

Do not be paralyzed by the fear of making a mistake. From my experience on the east coast, I can verify that even the authors of floras and top university professors occasionally make mistakes.

The iNaturalist community includes people with all levels of knowledge, from folks who want help identifying the most common of plants, to researchers with PhDs. For example, the fellow with a PhD in botany, who specializes in research on *Claytonia,* who explained to me why a photo of the spring beauty I posted was really a *Claytonia rosea*, not *C. virginica*. It's a great learning experience.

In the app, you can message people with comments and questions using a private message feature. For example, I specifically reached out to the person who corrected my spring beauty ID, asking for an explanation of how to make distinctions between the two species. You can also choose to follow conversations about ID if you wish to. I recently learned a lot about bats when experts from around the world collaborated in trying to get an accurate ID from a photo that was posted.

Down the Rabbit Hole

There is so much to iNaturalist that is not obvious to the beginning user. For example, Projects and Bioblitzes are two key features of the product and community of users.

You can also join or create projects. Projects focus on either species or a location. For instance, in Colorado you could contribute to the Rocky Mountain National Park, Alpine Thistles, Boulder Wildlife, and Flora of Colorado Projects among others. The Flora project is run by the Colorado Natural Heritage Program and needs our support. Project managers can seek and ask permission to add your observations to their projects. Projects can be fabulous tools for engaging students, kids, and community members in various endeavors related to plants. ►

◀ Bioblitzes are simply a blast. These events are boots on the ground efforts where groups come together at a particular place on an established date to try to record the totality of biodiversity present. You meet fellow enthusiasts who have expertise in plants, bugs, lichens, birds, and all manner of living things. The City Challenge link (https://www.inaturalist.org/projects/city-nature-challenge-2018) has become a popular annual international event and is a great way to connect people to nature, one of iNaturalist's primary goals. Bioblitzes are also organized around specific research needs.

Joining and learning how to use iNaturalist is remarkably easy, and there are great resources to show you exactly how it's done. Here are some hints for beginners:

- Use a mobile phone or a desktop computer or both; moving between devices is easy.
- Make your profile public with lots of details on your interests and specialties to get the most out of the app, or make your profile completely anonymous; and
- Record new observations or add observations from your past at any time. It's a great way to keep a record of your sightings in the field.

It's Easy to Get Started

1. Create your account at https://www.inaturalist.org/signup
2. Enter your first observations at https://www.inaturalist.org/pages/getting+started
3. Check out video tutorials that are short and simple at https://www.inaturalist.org/pages/video+tutorials

To participate fully on iNaturalist and get validations for your own observations, you need to be an active contributor by helping with identification for other users. Choose to identify by species, or choose a location to focus on. I always spend a couple of minutes just identifying from the main page any species, anywhere. I can help here only occasionally, but I always learn something. My observations might encourage another's observations. Specify which location or species you want to help identify (such as Colorado, milkweeds). Invest a few minutes being an Identifier. It's not only a time filler should you need one, but also an enjoyable way of learning. Soon you will soon be getting lots of Research Grade confirmations on your IDs.

Finally, let's give those birders some competition! When by dumb luck I am fortunate enough to capture a bird and post the photo, my observation is always confirmed within minutes. Plants, on the other hand, can take a long time to be identified.

Find me, or anyone else you know, on iNaturalist under People. Private message me if you want help. I'll see you soon on iNaturalist!

Sue Dingwell started her native plant journey in Florida, where the revelation of what plants could do in the hot sand scrub was a transformative learning experience. She became a member of the Florida Native Plant Society and used her background in education to become a dedicated advocate of native plants and conservation. A Master Naturalist in both Florida and Virginia, Sue is currently a member of both the Virginia and Colorado Native Plant Societies. She lives in Boulder.

Seasonal Union

by Arthur Clifford

A perfect peace, is falling snow;
fair it lays on fields below.
It clothes the body of Summer bare,
who once wore Fall's flower in her hair.

Her living gowns blue, red and green;
were tapestries on the fertile queen.
These garments now are veils of white,
Which dress her for a wedding night.

This date, December; twenty-one,
when life and death... Meet as one.
We revere the Season's sacred night,
as they conceive new growing Light.

This birth we witness in early Spring,
In buds that flower to fragrant sing.
They baptize the wood incensed bows of bloom;
for a Child is born... From Winter's womb!

Arthur Clifford is a member of the Metro-Denver chapter. As a child, he spent many hours with grandparents who gave him a sense of home and of nature in the florist shop and greenhouse on their farm. He and his wife of thirty-five years live on a small acreage west of Sedalia, where he germinates Colorado native plants in his greenhouse.

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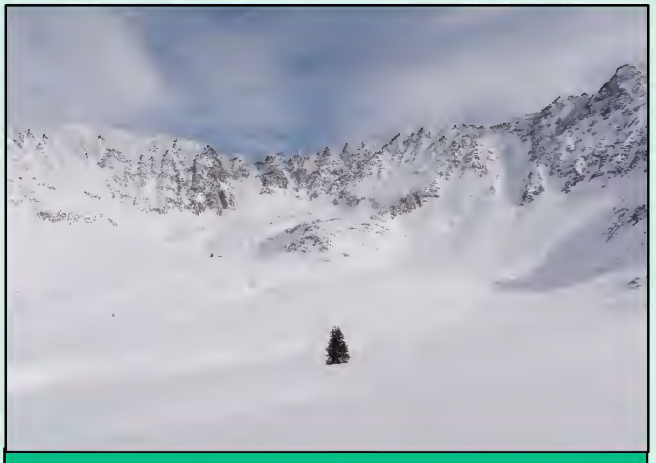

A lone tall-standing Douglas fir (*Pseudotsuga menziesii*) near the top of Mayflower Gulch, February 2014. © Kelly Ambler

Member Profiles: Board of Directors

By Lenore Mitchell

There are many members who help make CoNPS a successful organization. All are volunteers, with the exception of three talented and valuable part-time employees. In this issue, we profile the operating committee and leadership team, members at large, committee chairs, and chapter presidents—all voting members of the CoNPS board of directors.

Operating committee & leadership team

Instead of a president and vice president, CoNPS currently has an operating committee (OC) of six board members. There are also five members-at-large.

Preston Cumming was previously a board member at large. He joined CoNPS in 2008 when he was completing his doctorate in geography at CU Boulder, where he studied the effects of prescribed burning on native plant communities. He is currently an assistant director for the graduate teacher program at CU and enjoys exploring the Front Range, marveling in its beauty and native grassland communities with his two young boys and wife Helen.

Mo Ewing, board treasurer, OC member and conservation committee chair, was born in Providence, Rhode Island, and spent most of his working life in Boston, Massachusetts. He was a hospital administrator for 14 years and then owned a corporate travel business for another 14 years. In his mid-50s, he earned a master's degree in conservation biology and worked for the New England Wildflower Society. In 2003 he moved to Colorado and was land stewardship director for Colorado Open Lands, a state wild land trust. He has been a member of CoNPS since 2003. His favorite plants are mosses. Mo says, "all plants are important because without them photosynthesizing sunlight into energy, we would have serious problems finding dinner."

Ann Grant, PhD, also the horticulture committee chair, lives in Fort Collins with her husband Butch. They moved here in 1997 and opened a wholesale nursery, East Vine Farms, which they ran for 12 yrs. She was previously a board member-at-large and was chairperson for the 2018 Annual Conference. Her passion is growing and propagating natives. Currently as chair of the horticulture committee, she is working on a project for monitoring native plants in gardens.

David Julie, education and outreach coordinator and OC member, is a life-long vegetable gardener, which led to a captivation with insects, which led to a passion for native plants. He believes that understanding fosters appreciation, so he and his partner, Kate Goes In Center, focus on education, especially for young people. His favorite plant family is Fabaceae because bumblebees value the genera's high-protein pollen.

Jessica Peterson Smith, an active member and OC leader, resigned as of December 2018. The entire board appreciates her years of leadership.

Denise C. Wilson, OC member, loves conservation and the Colorado Native Plant Society. As a native seed collector for Chicago Botanic Garden's Dixon National Tallgrass Prairie Seed Bank for 12 years, and a past Wildlands Restoration Volunteers employee, she believes in restoring lands and lives it. She contributes many hours to CoNPS projects and supervises the part-time workshop coordinator.

Amy Yarger, board secretary and OC member, received a bachelor's degree in ecology and evolutionary biology at the University of California, Irvine, then went on to study plant-animal interactions at the University of Michigan. Her master's thesis concerned the effects of noxious weeds on pollinator-plant relationships. Her work as horticulture director at the Butterfly Pavilion, where she has worked since 2000, touches on many of her passions: plants, insects, habitat conservation and science education. She has served on the board since 2016.

Members-at-Large

Christine (Chrissy) Alba, PhD, is an assistant research scientist at Denver Botanic Gardens. Among her specialties are plant diversity and distribution, invasion biology, and ecological research. She recently completed a comprehensive research study of both native and non-native flora along the Highline Canal which begins east of Strontia Springs in Waterton Canyon and extends through metropolitan. ►

◄ Denver. She published an article on this project in the Spring 2018 issue of *Aquilegia* (Vol. 42. No. 2).

BethAnne Bane is from Baltimore and comes from a family of flower and vegetable gardeners. Upon moving to Colorado, Beth quickly came to realize that most plants require more assistance, intervention, and water than she was willing to provide, which led her to research and love Colorado native plants. Beth had been volunteering for CoNPS for about five years before deciding to join the board

Deryn Davidson was born in Fort Collins and is the CSU horticulture extension agent in Boulder County. She's been a member of CoNPS since 2014 when she and her family moved back to Colorado. For plants, she tends to have seasonal favorites which change yearly. At the moment, she's loving little bluestem (*Schizachyrium scoparium*) because they are beautiful and functional. She's the proud mom of a little tyke who recently learned all about walking.

Steve Olson, also the bioblitz coordinator, was a Chicago suburbanite (Wheaton, in particular). He spent about eight years in and around Southern Illinois University in Carbondale and then three years with the Indiana Department of Natural Resources working on rare plant surveys on the Hoosier National Forest. For the next 11 years, he was a botanist and natural resources specialist on the Hoosier NF. After 20+ years in the lower Ohio River Valley, a fascination with poison ivy, ticks, chiggers, humidity, and more wore off, so he managed to get the forest botanist position on the Pike-San Isabel NFs and Cimarron-Comanche NGs where he's now been for 16 years. Steve lives in Pueblo.

Tom Zeiner is a retired geologist and lives in Denver with his wife and family. He recently provided an interesting talk on the geology and flora of Crested Butte for the Metro-Denver Chapter, and he also serves as president of the board of directors for the annual Wildflower Festival in Crested Butte, where and he and his family live part-time.

Honorary board members

Jack & Martha Carter are the authors of the newly revised *Common Southwestern Native Plants* with Donna Stevens and Jennifer Bousselot. Jack is professor emeritus at Colorado College and the Carters are long-time educators and promoters of Colorado flora. They say they are "well into our eighties," but remain full of enthusiasm for CoNPS.

Chapter presidents

John Bregar is president of the Southwest chapter. He has lived all over the United States and in Alberta, Canada. He has led botany trips and bird watching trips, as well as mountain climbing and hiking trips, for many years in many locations. He spent a career as a geologist and geophysicist in oil and gas exploration, until he retired to Durango eleven years ago.

Susan Carter is one of the three Plateau chapter co-presidents. She was born in Pennsylvania and attended college at Delaware Valley College of Science and Agriculture where she earned a BS in ornamental horticulture. She then pursued her MS in landscape architecture at North Carolina State University She then moved to Colorado 25+ years ago. Susan was a CoNPS member in the 1990s and now again for the past two years. She is the horticulture and natural resources agent for CSU Extension Tri River Area (Mesa, Delta, Montrose, and Ouray Counties). Susan is also a certified arborist, CSU Extension Native Plant Master® leader, and CO professional gardener. Her favorite part of her job is to teach native plants on site.

Maggie Gaddis, PhD, is the Southeast chapter president. She teaches biology at the University of Colorado in Colorado Springs and at Colorado Mountain College. She is a member of the Bard College Citizen Science faculty. Her research involves citizen science and ecological restoration monitoring in southern Colorado. Maggie and her family live on an urban microfarm in historic Colorado Springs where they grow native and edible plants and raise chickens and bees. She says plants are the foundation for all ecosystems on planet Earth. Her current favorite is amaranth, and she says some plants in this family, although native, are too often considered agricultural weeds, which is "plant prejudice."

Hugh Mackay, Northern Chapter president for Fort Collins and Loveland, is originally from England and Scotland. He came to the US at age seven and grew up in coastal Maine where his interest in plants developed. As an English major at Villanova University, he financed expenses by working as a tree climber for tree surgery companies. He, his wife, and four children moved to Fort Collins in 1974, where he worked in academic science publishing. His interest in plants and native flora increased during hikes in the Colorado mountains. He joined CoNPS ten years ago and planned field trips for the northern chapter before becoming chapter president in 2018.

His favorite plant family is Pinaceae because it denotes "wilderness" to him. Hugh says all plants are important because life is impossible without them.

Lenore Mitchell, metro-Denver chapter president, is a Colorado native and has fond memories of riding horses in places now lost to development such as Highlands Ranch, Roxborough State Park, and many more. She was a master gardener for 10 years and has taught the Native Plant Master® course for CSU ►

◀ Extension for more than 12 years and has presented courses for Osher Lifelong Learning Institute (OLLI) at Denver University and other programs. She's also a long-time member of CoNPS and enjoys the opportunities to keep learning more about Colorado's flora. She says teaching is a great way to keep learning.

Jim Pisarowicz is from Montrose and is one of three Plateau chapter co-presidents. Two years ago, he retired as a psychology professor in Ohio. He has been a CoNPS member for two years, but before returning to Colorado he was affiliated with the Cincinnati Native Plant Society and other Ohio botanical groups. He is a photographer and shoots plant pictures year-round from showy flowers to the remnants of plants as the winter sets in. Said Jim, "I see the beauty of plants no matter what the season."

Pam Sherman is the new president of the Boulder chapter, but served as president of that chapter several years ago. She is happy to be back and is learning a lot from everyone's varied interests and questions. Her interest is in promoting native plants as part of a healthy indigenous ecosystem and in researching this as the necessary context for food growing. She is currently focusing time on an ethnobotanical research project on nursery-sold native landscape plants. She lives at 8300' in rural Boulder County, where for over 25 years she and her husband have trialed and grown varied crops within the mostly intact native ecosystem. She is also interested in more dialogue around fire mitigation vs. supporting indigenous ecosystem growth on both small and large acreages and how these decisions impact high altitude ecosystem health across the mountains.

David Varner is also Plateau chapter co-president. With experience on river restoration projects throughout the western US, he works with RiversEdge West in Grand Junction to design and implement sustainable riparian conservation projects. David received a BS from Montana State University and worked as a seasonal field biologist before returning to school to study coastal stream restoration at Humboldt State University. Since then, he has worked in a variety of freshwater habitats in the Great Basin and Pacific Northwest, as well as charitable natural resource conservation projects in South Asia, Mexico, and the American West. David enriched his conservation experience by serving a term on the board of California Native Plant Society and as President of the San Diego Chapter. An avid recreationist, David loves to explore Western Colorado and beyond- by bike, hike, ski, boat, and book. His latest favorite outdoor pastime, though, is sharing it with his toddler daughter. ✵

◀ "Pawnee Buttes…" *continued from page 16*

- Coordinating with the USDA Forest Service, and any other applicable federal agencies, in the development of the management and use plans for the Pawnee National Grassland.

References

CNHP. 2018 (March 3). CNHP Potential Conservation Area Reports. Accessed 2 December at: https://cnhp.colostate.edu/ourdata/pca-reports/

Hazlett, Donald. 1998. *Vascular Plant Species of the Pawnee National Grassland*. General Technical Report U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

U.S. Forest Service. 2018. *National Grasslands: The National Grasslands Story*. Accessed online November 25, 2018 at: https://www.fs.fed.us/grasslands/aboutus/

Weld County. 2018. Weld County Colorado Planning and Zoning: Oil and Gas. Weld County Oil and Gas Updated June 2018. Accessed 2December2018 at https://www.weldgov.com/departments/planning_and_zoning/oil_gas/

Crystal Bravo-Cogar holds a BS in biology from West Virginia University. She spent 17 years working as a supervising field biologist at an environmental consulting firm in Las Vegas, Nevada. Her experience includes conducting field surveys for and protecting Mojave Desert flora and fauna, including the Mojave Desert tortoise, and various succulent and special status species. Ms. Bravo-Cogar relocated to Denver last summer and is loving Colorado. She currently works at an engineering firm as a senior environmental specialist where she conducts siting-related research and field studies, and prepares environmental permits for renewable energy and transmission projects. ✵

Apply Now for Marr and Steinkamp Research Grants

Thanks to the generous contributions of many CoNPS members and supporters, approximately $10,000 each year is available for research grants. These two separate funds honor the late Dr. John Marr, professor at the University of Colorado and first president of the Colorado Native Plant Society, and Myrna Steinkamp, a founding member of the Colorado Native Plant Society who worked on behalf of CoNPS for many years in a variety of capacities. Both funds were established to support field and laboratory research on the biology and natural history of Colorado native plants.

The Marr Fund supports research on the biology of Colorado native plants and plant communities.

The Steinkamp Fund supports research on the biology of Colorado rare native plants.

Applications are due February 15. More information can be found at CoNPS website.

CoNPS Membership

Name_____
Address _____
City _____ State_____ Zip_____
Phone _____
E-mail_____
Chapter (if known) _____

CHAPTERS: Boulder, Metro-Denver, Northern (Ft. Collins-Greeley), Plateau (Grand Junction & West Slope), Southeast (Colorado Springs-Pueblo), Southwest (Durango) or Unaffiliated

If this is a change in address, please write your old address here.
Address _____
City _____ State_____ Zip_____

☐ **Check box to receive information on volunteer opportunities**

DUES include *Aquilegia* newsletter, published quarterly.

The 36-page, full color electronic publication arrives by PDF in member email boxes in February, May, August, and November. Black-and-white copies can be mailed to members without email addresses.

Membership dues cover a 12-month period.

□ New □ Renewal

□ Student $17 □ Senior (65+) $17 □ Individual $25
□ Family $35 □ Plant Lover $50 □ Supporting $100
□ Patron $250 □ Benefactor $500 □ Life Member $800

CONTRIBUTIONS to CoNPS are tax deductible:

John Marr fund for research on the biology and natural history of Colorado native plants $ _____

Myrna P. Steinkamp Memorial fund for research and other activities to benefit the rare plants of Colorado $ _____

Total included: $ _____

Please make check payable to:
Colorado Native Plant Society

Send completed form and full remittance to:
CoNPS Office
PO Box 200
Fort Collins, CO 80522

You may also join online at
https://conps.org/mfm-join-page/

Meet Two New CoNPS Employees

Kathleen Okon is the new workshop coordinator. Kathy has had a passion for nature and natural resources since she was a young child. This passion has led to extensive education and experience in natural resources, environmental education, environmental stewardship, and sustainability. Kathy holds an MS in environmental policy and management from Denver University, a BS and teaching certificate in natural resources & environmental education from Michigan State University, a certificate in sustainable practices from CU, and certificates in CSU's Native Plant Master®, master composter, and energy master programs. In addition, Kathy has over 20 years of experience in creating and coordinating award-winning environmental education and sustainability activities, including seminars, garden tours, plant surveys, research, and more.

Ean Thomas Tafoya is the new marketing and events coordinator. His experience with plants stems from his early childhood memories growing food in a community garden. He has started gardening and composting programs at several schools and community institutions and volunteered in the greenhouses for both the city and County of Denver and the Denver Zoo. These experiences led Ean to pursue a horticulture therapy certificate, in hopes of working with youth with sensory integration disorder. He is near completion of the program. He also conducted undergraduate research on increasing yields of herbaceous plants in greenhouse settings via organic methodologies, and he was recruited to co-author of a local food systems policy paper for Denver Mayor Hancock. In 2018, Ean worked on three ballot initiatives that raised dollars for parks and river conservation, as well as food access for youth. Ean is excited to work with CoNPS and looks forward to building relationships with members.

Can you ID these Plants and Pollinators?

Answers (clockwise from top left): *Poanes taxiles* (taxiles skipper) on ***Asclepias speciosa*** (showy milkweed), Apocynaceae family. *Boloria chariclea* (Arctic fritillary) on ***Wyethia arizonica*** (Arizona mule's ears), Asteraceae family. *Plebejus icarioides (*Boisduval's blue) on ***Erigeron divergens*** (spreading daisy), Asteraceae family. *Trichiotinus piger* (bee-like flower scarab) on ***Rosa blanda***, Rosaceae family. *Melanoplus* sp. grasshopper on ***Erigeron coulteri*** (Coulter's daisy), Asteraceae family. *Drasteria hudsonica* (northern arches moth) on ***Platanthera purpurascens*** (purple-petal bog orchid), Orchidaceae family. All photos © Jan Gorski

Colorado Native Plant Society

P.O. Box 200
Fort Collins, Colorado 80522
http://www.conps.org

Apply Now for Marr and Steinkamp Research Grants!

See page 33 for details.

The 2019 Spring Colorado Native Plant Sale Is Open

Place your order now through April 15 for pickup on Saturday, May 4 from 9 AM - 12 PM in one of four pickup locations along the Front Range.
https://conps.org/2019-spring-plant-sale/

Colorado Reader Helps Raise Native Plant Awareness Among Children

Last Spring, CoNPS helped fund the development and distribution of a *Colorado Reader* devoted to Colorado Native Plants. The eight-page newspaper geared toward 4th and 5th grade students meets life science and reading, writing, and communicating standards for Colorado. This issue includes the following subjects:

- Why native plants are important;
- A discussion about biodiversity;
- Basic guidelines for protecting native plants;
- Colorado's seven life zones;
- Information about wildlife and pollinators; and
- How Native Americans used native plants.

Other issues of the *Colorado Reader* include topics related to food, fiber, and natural resources. For more information, visit https://www.growingyourfuture.com/ Developing *Colorado Reader* is a project of the Colorado Foundation for Agriculture. Classroom sets are free to educators who request them. Each issue is accompanied by a teacher's guide and reproducible student worksheet to reinforce learning objectives.

Colorado Reader

Agriculture in the Classroom - Helping the Next Generation Understand their Connection to Agriculture

Food, Fiber and Natural Resource Literacy

Colorado Foundation for Agriculture – www.GrowingYourFuture.com

Colorado Native Plants

Native plants are species that naturally occur in a particular region. Many varieties of plants developed over millions of years, and are well adapted to Colorado's windy, dry, and sunny climate. Many of our native plants can be beautiful, hardy garden plants that require very little water.

Native plants have a very special relationship with the native insects and birds that depend on them for food and shelter. As people have moved into Colorado, they have brought plants from other parts of the world. But many of these plants are not useful to Colorado's wildlife.

Flowers contain many parts including petals, stamens, and pistils. **Stamens** produce **pollen**. **Pistils** are the parts of the flower that produces seeds. When pollen makes contact with the pistil of flowers, they become fertilized and produce seeds. This is how flowers reproduce. When **pollinators** - birds, insects, or other animals - collect food from flowers (nectar and pollen) they also fertilize flowers by carrying pollen from plant to plant.

Native plants and pollinators adapted to each other over a long time together. This is called **co-evolution**. For example, some insects and birds have long tongues. These tongues allow them to drink nectar from long flower tubes that other birds and insects cannot reach. Plants also produce chemical defenses against insects. The insects evolve to tolerate and cope with those chemicals. Limiting which pollinators can feed on the flowers benefits plants, too. It increases the chance of being visited by pollinators that have been feeding on similar flowers and receiving the right kind of pollen to be fertilized.

Native plants and pollinators depend on each other. Growing native plants in your garden can help preserve wildlife and add to Colorado's unique natural beauty.

Colorado Agriculture in the Classroom 1 www.GrowingYourFuture.com